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ERRATA.

P. 348, Eighth line from bottom of page. For "*Laiop-tery.*" read '*Laiopteryx*".

P. 403, Opposite the name "*Enycteris Spelaea* (Dobson)" add in the third column after the word "known" the words "in Burma."

P. 409, Blanford (*op. cit.*, Vol. IV, p. 485) retracts the name "*Collocalia francica* (Gmel.)" in favour of "*Collocalia unicolor.*"

P. 409, Fourth line from bottom of page. For "*ridleyi*, Boulenger" read "*ridleyi*, Butler" and add reference: *Journ. Bombay Nat. Hist. Soc., xii, p.* 425.

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JOURNAL

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1. The Mīrzā Nāmah (The Book of the Perfect Gentleman) of Mīrzā Kāmrān with an English Translation.

By Mawlavi M. Hidayat Husain,
Lecturer, Presidency College, Calcutta.

Last year during the vacation I was invited by my much esteemed friend Qaḍī Muḥammad Maḥmūd Ṣāhib of Chakdah, Nadia, to stay a few days with him and inspect his small library which contained some books on Muhammadan Jurisprudence, Tradition, etc. Among them I came across this unique MS. entitled Mīrzā Nāmah.[1] He generously lent it to me. It is in a bad *shikastah* and consequently I took a long time to decipher it and make the transcript for the press.

Although the title-page goes to prove that this was written by Mīrzā Kāmrān, yet there is nothing in the context of the book which might establish the identity of Mīrzā Kāmrān the learned son of Emperor Bābur with this Mīrzā Kāmrān. The only persons mentioned as his contemporaries in this pamphlet are Rafī'-i-Sh̲īrāzī, Jalālā-i-Ardastānī and Qaḍī Zādā-i-Girahrūdī. Mīrzā Rafī'-i-Sh̲īrāzī was the author of the Taẕkirat al-Mulūk, and he has mentioned in his preface that in the year 1017 A.H. when his age was seventy years he began this book.

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[1] Dr. Rieu in the "Catalogue of Persian MSS. of the British Museum," p. 826, No. V, mentions another work of same name and says the work, which is anonymous, was apparently written in India. It begins:—

قملي سر كنم بنام خدا ميرزا نامه را كنم انشا

A copy of this book also exists in the library of the Asiatic Society of Bengal. It contains the author's name which is Mīrzā Muḥammad Kh̲alīl.

According to this statement Mīrzā Rafi' was born in 947 A.H. whereas Mīrzā Kāmrān, son of Emperor Bābur, died 964 A.H., so that when Rafi' was about 17 years, Mīrzā Kāmrān died.

So far as I can ascertain this pamphlet is not the work of the Prince Mīrzā Kāmrān, because at the age of 17, Rafī' Shīrāzī could not have been such a scholar that Prince Kāmrān would write about him thus:— بهترین معاصرین خود داند "He (the *Mīrza*) must consider him the best of his contemporaries."[1]

However there is no doubt about the pamphlet belonging to the eleventh century Hijra.

The word *Mīrzā* is a short form of Amīr Zādah. *Mīrzā* was used in ancient times for kings and princes only. The Timuride sovereigns from Tamerlane down to Bābur are called *Mīrzā*, *Bābur* is the first sovereign of the dynasty who gave up the title of *Mīrzā*, and used the title of *Bādshāh*. We find the following statement in the *Ma'āṣir-i-Raḥīmī*[2] تا آن وقت اولاد حضرت صاحبقرانی را میرزا می گفتند درین تاریخ بادشاه گفتند "up to this time (913 A.H.) the descendants of Tamerlane were called *Mīrzā*, but from 913 A.H. they were called *Bādshāh*." In India this word began to be used for Muḥarrirs (clerks) from the time of Nādir Shāh's invasion. It is found in the Bāhār-i-'Ajam that, from the time Nādir Shāh came and conquered India, people who were clerks to the Crown were called *Mīrzās*. At present in Persia there is a distinction in using this word; when it is prefixed to a name it means clerk, but when suffixed it means prince.

The Mīrzā Nāmah by Mīrzā Kāmrān.

Incomprehensible praises and thanks are due to God, whose entity is independent of the eulogies of all created beings; and boundless blessings be on the luminous and sacred tomb of our Lord Muḥammad Muṣṭafā, peace be on him and his descendants and salutation. Let it not remain hidden from the wise that (while travelling) through *Hindustān*, the abode of safety, in the year 14th, according to the dictates of fate, after having visited the paradise-like *Kashmere*, this helpless being (the writer) happened to pass by *Lahore*, the capital. (He observed that), as accident would have it, a body of reckless men of this country in accordance with their inborn propensity having uplifted their heads, had entitled themselves with the dignity (or rank) of *Mīrzās*. As this slave (the writer) had some rightful claim to this position, my sense of honour did not allow me to let this great revolution and disorder undermine the rules and regulations on which the rank of a

---

[1] This occurs in context, p. 5.

[2] Vol. I, p. 495.

Mīrzā is based. It being a matter of great importance, I thought I ought to write a treatise on this subject, which may become the guide of mankind, so that no one may venture to claim this great thing (honour) without deserving it.

Verses.

(Though) you may know much (but) speak little ;
Do not speak one as a hundred (or do not exaggerate),
(but rather) make one of a hundred.

It ought to be known, that, as I have become a *Mīrzā* by the force of personal exertions and the practice of laudable attributes, whatever I say is pure truth and (is spoken) out of good will. Though my words are mixed with wit and humour, yet this pamphlet will effect certain conclusions, each one of which may be called the guide of Plato and the helper of Avicenna. In short, if any careless and dull-headed fellow forms a slight opinion of my work owing to his defective intelligence, what fear has the Sun from the inattention of the bat, and what anxiety has the firmly-seated mountain from the undermining of the wild rat.

Verses.

A few unskilful fellows, ignorant of their own selves,
Take delight in defects, thinking them to be merits.
(Their self-conceit and vanity) act like smoke when they reach the brain (making it cloudy and defective) ;
(And) act like the wind, if they reach the light (of clear intellect, by extinguishing it).

If any one has a fancy for becoming a *Mīrzā*, he should attain to the state defined in this treatise. But if he fails, why should he attempt such a hazardous undertaking, and thereby let a large body of men distinctly see into his mean origin and vain aspirations ?

Chapter I.—On the Main Rules of the Code of Mīrzāship.

It should be known, that, in the code of Mīrzāship, there are ten main rules or principles, and several subsidiary ones. Among the main principles, the first is, that (an aspirant for Mīrzāship) should know God, because the perfection of every individual is shown by his knowledge of God. The second is, that he should acquire knowledge and virtue, with a view to free himself from the deception (or betrayal) of ignorance, and not with an aim (simply) to gain eminence. And in the beginning he must swiftly pass through the subject of Accidence and Syntax (or Grammar) ; and an acquaintance with these

two branches of learning must be deemed necessary by him so far as to enable him to be correct in his everyday conversation and modes of writing and speaking Arabic and Persian words. In society he should try to guard against the shame of committing any mistake in conversation, for such incorrectness in speech is considered a great fault in a *Mīrzā*. The third is, that he should pass off from the *Gūlistān* and *Būstān* of S'adī[1] at the age of thirty (?). The fourth is, that he should possess a knowledge of men (and the world), because it is the best of all perfections; and he must not be carried away by the words of every impudent fellow or deceitful person, who says that he has captured the genii several times, unless he sees all these with his own eyes, but even then there is room for suspicion; inasmuch as those who know such things are usually silent, while those who do not know pretend to such powers in order to deceive the simple. The fifth is, that he should not engage himself in a literary controversy with a student fresh from the nook of the college, who will destroy the tranquillity of his disposition by the obstinacy of his defective knowledge. The sixth is, that he must not speak to every unworthy person, and should regard men worthy of his own society as (the only fit) companions (for him). The seventh is, that he must know the Arabic, Persian, Hindustani and Turkish languages. The eighth is, that he should be an expert in composition and a quick worker, because this valuable life is too fleeting. The ninth is, that he should possess an acquaintance with, and experience of, accounts, though he need not be wholly given up to them. The tenth is, that he must understand the several stages in Philosophy, but he should not involve himself in discussions concerning fate versus free will, and the accidental versus eternal, for they cannot lead him to any conclusion. But he should know the other questions of philosophy, but only to an extent that he may be able to say "I know."

Chapter II.—On the Subsidiary Rules of the Code of Mīrzāship.

Firstly, there should be a distance of one mile between a *Mīrzā* and a wild elephant. If chinaware is available, he should avoid taking meals and eating fruit from silver and gold plates; and if he can get hold of earthenware, he should not drink water from chinaware. If there be ten good people in a house and one bad, he should cut off intercourse with those ten. If they have named him Mīrzā Jalāl al-Dīn Yūsuf, he must not encumber himself with all this, but shortening it style himself Mīrzā Yūsuf. When purchasing a thing wanted by him, he should not make any difficulty about

[1] Died 690 A.H.

the price, and ought not buy like traders. Ruby should be regarded by him as the best among all jewels, and the palanquin as the best of all conveyances. He should like a watermelon as the best of all fruits. If he wishes to keep his head and hands entire or unbroken, let him not accompany an army through *Kashmere*. Rice boiled with spices should be preferred by him above all other eatables. He should keep pure love on a high arch, and if possible, he should have no connection with it at all. He should not follow a beautiful person whose demeanour displays tokens of wickedness, and he must not make too much use of tobacco. As long as he is in India to the best of his power he should try to keep himself safe from the attack of diseases, so that he may not have the need to see the face of the court physician. If he is introduced to a family, he must go there thrice, first on the day of introduction. On the second occasion he should make compliments and enter (the house). On the third occasion, if he is welcome without paying compliments, he may continue to frequent the place, otherwise he should not trouble himself for nothing, and incur dishonour, because respect, once lost, is hardly to be regained. He should regard *Lahore* as the best of the towns in India. He should recognize the fort of *Agra* as unequalled in the whole world. If there be no controversy or dispute on that point, then he must think *Isfahān* as the best town in Persia. In a multitude he must always be on the alert from attacks of swords kept under the garment. He must have funds enough to supply him with twenty rupees for the expenses of palanquin and a door-keeper. He must not hire a room in any inn, for it is beggarly to do so. He must value life and should not go near war. If he happens to be in a battle-field he must keep out of the reach of musket-balls. If victory takes place, he must not pursue the defeated and flying army; on the contrary if his party suffer a defeat, he must run away as fast as he can. The compositions of a *Mīrzā* should be full of expression, and in a short compass of words should convey a number of ideas and meanings. If they are not so, what is then the difference (between a *Mīrzā* and others). Wherever he may see (or meet) the narcissus, the violet and the orange, he should take all three. He must know the bad people, but should not call them bad for this is contrary to wisdom. He should know the game of dice, but must not turn a gamester, and should not bet thousands while playing chess. He must not be fond of obscure verses (and spend his time in trying to understand them), because this precious life should not be thus wasted away. He must not follow a companion who is a fast rider, and should let him go wherever he likes. If a friend of the *Mīrzā* ask what his salary is, he may tell the man if he is sure that the latter will not be appointed in his place; otherwise he should run away from him to a distance of about

twenty *kurūh*,[1] i.e. forty miles. If a *Mīrzā* happens to sit at the same table with a *Muftī* (or lawyer), he should not take anything, and in case he dies of hunger (by so doing) he shall have a great reward in next life. If a *Mīrzā* has beauty and good voice, he may without inconvenience recite a verse or two before his companions; but if he sings regularly at some length, he should separate his cups and jugs because he has thus become a professional musician. He must know Qāḍī-zāda-i-Girahrūdī, Mīrzā Rafī' Shīrāzī and Jalālā-i-Ardastānī as the best of his contemporaries; but if any one objects to this, he must not enter into dispute with him. He should not trust any well-clothed person who pretends to be an author. If there is controversy between the *Mīrzā* and some one, and if the *Mīrzā* happens to get the better of him, he should completely defeat him, but if it be otherwise, then he must make up with his adversary. If a *Mīrzā* happens to be in company with some persons of eminence, and if the topic of conversation refers to one's income and ability, he should try to get the topic changed; if not, he should leave the house to its owner and run away as fast as his feet can carry him, and must not look back at all. The *Mīrzā* should visit *Egypt* because it is worth seeing. If he wants to settle in a place, let him take up his abode in *Syria* where nice bread, cheese, and sweet melons are to be found though they are the food of the *Rāfiḍī*.[2] But if a *Mīrzā* of the true Mussulman type gets them let him eat them, for they won't hurt his religion. In India he should not wear the *chakshūr*[3] and he must not be too fond of his own words. In company he should not take part in controversies, especially in religious ones. Let him keep his religious views quite secret, lest they cause him some bodily injury. If he be in service, then as long as he does not get the rank of five hundred, he must not take guests to his house; and in times of trouble let him avoid being a guest of low people, for this will end in insult. He must regard games of hazard as the best of all entertainments in the world. He should not speak of the honour of anyone. He must not joke with every good-for-nothing fellow, nor allow all people to cut jokes at him. He should meet his friends occasionally, and when seen once, he must not go to them again that very day, because this will cause a recurrence (of the visit). With a monthly salary of Rs. 100 let him allot Rs. 10 for the belt and embroidered badge. And if these are supplied by his master he must not sell them. If he spends Rs. 50 for a fur, it will not be prodigality. He must not speak while people are playing draughts. He should not bring courtesans to other people's house, especially if the

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[1] *Kurūh* is a road-measure of about two miles.
[2] One of the sect of the shi'ahs or followers of Hadrat 'Alī.
[3] A kind of garment.

master of the house happen to be richer than he. If dirt happen to be on his auspicious face, he must wash it out with salt and vinegar; and he should not rely upon anyone except a worthy darvish. In reciting poetry, he should not omit the first line of a poem, even if it be simple. If a man recite the first line off a couplet, the *Mīrzā* must not read out the second line. In India if he secures a house, he must not be in search of mere architectural beauty, but must pay due consideration to its stability lest he may not suffer an untimely death in the rainy season. In a bath he must not allow the body of a sick barber to touch his body, but he should be civil to his son. He may pour from the store a small quantity of water on his head, if he has bathed in a narrow reservoir used by several persons. If he wants to avoid insults, he must drive out from his head the weakness of sitting in a prominent place. In India he should not expect intelligence and good behaviour from those who put big turbans on their heads. If he does not want to undergo insult and disrespect, he must not entertain expectations from familiar intercourse with people, saying: "I am going to see such and such a rich man; he will give me a thousand rupees and bestow many presents." In India do not make the taking of *Pālūdah*[1] and *Firnī*[2] grow into a habit, for this brings in idleness and loss of spirit. With the rank of a centurion (Manṣab-i- Ṣadī), the Mīrzā must not cause the cover of his hubble-bubble to be made of silver and put silver on the reins of his horse, because they would not remain with him. If he is riding with a superior officer, he must keep a step or two behind him; but on reaching a bridge he must lead the way, and return to his old place when the bridge is passed in safety. In times of misfortune he must not take anything in a brass pot if its edges are engraved, for dust remains there and is not removed even by washing. If possible he should not open his mouth at the door of the inn of *Sambal Khān*, for there are many absurd reasoners. He must keep himself aloof from a few things, if he wants to render himself free from trouble. If any one begins a long story, he should not attend it, because it is styled the prison-house of intercourse; he must in no case discuss anything with those who are addicted to discussion, because this is a plague of intercourse. As far as he can, he must not fetter himself with the intimacy of *Muḥammad Ṣāliḥ Beg* the scribe, and *Mīrzā Fadl Beg*, a particle of the signs of whose powers of production is the book, called *Kalīlah wa Damnah*.[3] In an assembly where many people have been invited, the *Mīrzā* must not go

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[1] A kind of sweet beverage made of water, flour, sugar, etc.
[2] A kind of sweet dish prepared by flour, milk and sugar.
[3] A very famous work of Indian tales, translated into Arabic by 'Abdulla bin al-Muqaffa', died A.D. 757.

first, because if he does so, he shall have to do respect to many people, and this case is called *chār mawja-ī-ikhtilāṭ* (four-sided waves of intimacy, i.e. a case productive of troubles). However if any one has a fancy to become a *Mīrzā* let him consult this treatise first.

بسم الله الرحمن الرحيم

ميرزا نامه

از

ميرزا كامران

حمد و سپاس بيقياس خداى را سزاست كه ذات او از تعريف مخلوقات مستغني - و درود بى نهايت بر مرقد منوّر مطهّر حضرت محمد مصطفى صلّى الله عليه و آله وسلّم - بر ارباب معني مستور نماند كه در سنه ۱۴ حسب التقدير در دار الامان هندوستان بعد از سير كشمير بهشت نشان عبور اين مجبور بسمت دار السلطنهٔ لاهور افتاد - بحسب اتفاق جمعى از متمرّدانِ ممالک از قاعدهٔ ذاتي سرى برداشته خود را بصفت ميرزائي موصوف ميداشتند - چون بنده را استحقاق اين امر بود غيرتم نگذاشت كه اين چنين انقلابي و فتوري در رسوم قواعد ميرزائي واقع شود - بخاطر رسيد كه رسالهٔ درين باب بايد نوشت كه اين امر امر خطيريست كه دستور العمل اهل روزگار گشته - احدي بغير از استحقاق داعيهٔ اين چنين مطلبى عظمى نكند -

سخن بسيار داني اندكى گوى * يكى را صد مگو صد را يكى گوى

بايد دانست كه چون بنده بنور رياضت وكسب اخلاق پسنديده ميرزا شده ام آنچه ميگويم محض خير و صدق است - اگرچه كلامم بمطايبه و هزل آشنا است اما نتايجى چند ازين نسخه بر مي آيد كه هر يكى را رهنماى افلاطون ودستگير بوعلي توان گفت - خلاصهٔ مطلب آنكه اگر گوته نظري از روى نا رسائي كلامم را سهل شمارد آفتاب را از كم توجهئ شپره چه پروا - و كوه گران پايه را از كنج كاوئ موش بياباني چه انديشه -

بی هنر چند ز خود بی خبر * عیب پسندند بزعم هنر

دود شوند ار بدماغی رسند * باد شوند ار بچراغی رسند

اگر شخصی را هوس میرزائي در سر افتد آنچه درین نسخه قید شده بکیفیت این برسد - و اگر نتواند چه لازم است که مرتکب این امر خطر گردد - و جمعی را بر کم ظرفي و بلند پروازئ خود مطلع سازد * باید دانست که در قانون میرزائي اصول ده است و فروع چند - از جملهٔ اصول اول آنکه مي باید خدای را بشناسد که کمال هر فردی از افراد انساني از خدا شناسي ظاهر مي گردد - دویم آنکه کسب فضیلت کند برای آنکه نفس را از خیانت جهل بر آرد - و صدر نشیني بخاطرش منظور نباشد - و در ابتدا از علم صرف و نحو زود بگذرد - و ضبط این دو علم بقدر حاجت برای تصحیح الفاظ روز مرّه و تتبع لغات عربي و فارسي را ضرور داند - و سعي کند که در مجالس از خجالت غلط روز مرّه محفوظ ماند که غلط در گفتگو از میرزا عیب عظیمی است - سیوم آنکه درسنّ سي؟ سالگی از گلستان و بوستان شیخ سعدي بگذرد - چهارم آنکه آدم شناس باشد چرا که بهترین کمالات است - و بقول هر طرّار و شیّادی که گوید که چندین بار تسخیر جن کرده ام فریفته نشود تا آن جمله را برای العین مشاهده نکند - بلکه درین هم سخن است - زیرا که آنکه داند نگوید و آنکه نداند اظهار کند تا احمقان را بازي دهد - پنجم آنکه با طالب علم تازه از کنج مدرسه بر آمده در بحث علمی طرف نشود که به ضَرَبَ ضَرْبَةً دمار از روزگار طبیعت بر مي آرد - ششم آنکه با هر ناقابلي سخن نگوید - حریف هم صحبت خود را شناسد - هفتم آنکه زبان عربي و فارسي و هندي و ترکي یاد کند - هشتم آنکه منشي طبیعت باشد و شتاب کار بکند که عمر گرانمایه کم بدست مي آید - نهم آنکه در علم میاق وقوفی و بهرهٔ داشته باشد اما محرّر طینت نباشد - دهم آنکه از مراتب حکمی خبر داشته باشد - اما ببحث جبر و اختیار و حدوث و قدم نه پیچد که بجائی نمي رسد - دیگر مطالب حکمی آنقدر بداند " که میدانم " تواند گفت -

باب در مقدمات فروع

اولا از میانهٔ میرزا و فیل مست یک فرسنگ مي باید فاصله باشد - و اگر ظرف چیني میسر باشد در ظرف طلا و نقره طعام و میوه نخورد - و اگر ظرف گلي بدستش آید در چیني آب نخورد - و در خانه که ده مرد آدمي باشند و یک آدم بد باشد قطع نظر از اختلاط آن ده کس کند - و اگر میرزا جلال الدین یوسف او را نام کرده باشند در زیربار عبارت نرود وضع کند که او را میرزا یوسف گویند - و در قیمت آنچه او را درکار باشد مضایقه نکند و سوداگرانه نخرد - و یاقوت را بهترین جواهر داند - و پالکي را بهترین سواریها داند - و خربزه را بهترین میوها داند - اگر خواهد سرو دستش ثابت بماند در راه کشمیر با لشکر نرود - و خشکه با مصالح را به از طعامها داند - و عشق پاک را بر طاق بلند بگذارد و اگر دست بیابد پای را بکشد و صاحب حسنی که آثار شرارت ازو ظاهر باشد عقب او نرود - و افراط تمباکو نکند - ودر هند تا مي تواند خود را از بیماریها محافظت نماید - که روی طبیب منصب دارش نباید دید - در جائی که آشنا شود سه مرتبه خود را برساند - یکمرتبه روز اول که آشنا شود - دویم دعا برساند و داخل شود - مرتبهٔ سیوم اگر بی دعا راه یافت برود و اگر نه خود را تصدیع ندهد وخفت نکشد که آبرو بدست نمي آید - و لاهور را به از شهرهای هند داند - و قلعه آگره را یگانهٔ قلعجات عالم داند - و اگر بحث نکنند و طرف نشوند اصفهان را بهترین شهرهای ایران داند - و در وقت کثرت از ته بغل شمشیر احدي خبردار باشد - تا بیست روپیه روزینهٔ پالکي و دربان بداشته باشد - ودر سرا حجره نگیرد که گدای طبیعت مي شود - حیات را غنیمت داند و نزدیک جنگ نرود - اگر ضرور شود جائی که گولهٔ تفنگ نرسد بایستد - و اگر فتح روی نماید از پی لشکر شکسته و گریخته نرود - و اگر عکس واقع شود تا بتواند بگریزد - و کلام میرزائي باید که پر عبارت باشد و باندک لفظ معني بسیار ازو بر آید - و اگر این نباشد چه تفاوت - نرگس و بنفشه و نارنج را هرجا که ببیند از هر سه بگیرد - و بدان را بشناسد اما بد ایشان را نگوید که موافق حکمت نیست -

بازی نرد را بداند اما قمار باز نشود - در شطرنج داو هزار نبازد - و معتقد شعر مغلق نباشد که عمر گرانمایه کم بدست مي آید - و رفیقی که اسپ خود را جلد کند مقید او نشود - بگذارد تا بهر جهتی که خواهد برود - و شخصی که آشنای میرزا باشد و بپرسد که ماهیانهٔ شما بچه مبلغ رسیده - اگر میرزا داند که او را بعوض او نمي گیرند بگوید و اگر عکس باشد بیست کروه ازو بگریزد - اگر بر سفرهٔ شریک مفتي با میرزا قرین شود میرزا دست از طعام بکشد - اگر از گرسنگي بمیرد اجر عظیم دارد - اگر میرزا حسن و صوتي داشته باشد با مصاحبان خود مصرعی بخواند گنجایش دارد و اگر بسیار بخواند کاسه و کوزهٔ اش را جدا کند که خواننده است - قاضي زاده گر هرودي و میرزا رفیع شیرازي و جلالای اردستانی ایشان را قابل ترین معاصران وقت داند - و درخوبي این چند کس اگر کسي طرف شود بحث نکند - و قبای مصنّف را اعتبار نکند - اگر درمیانهٔ میرزا و کسی بحث واقع شود و میرزا برو غالب آید تقصیر نکند و اگر برعکس باشد با خصم مدارا کند - در مجلسی که چند مرد عزیز و میرزا نشسته باشد و هر یک بقدر ماهیانه و استعداد خود حرفی گویند میرزا اگر راه حرفی داشته باشد که منع ایشان کند فَبِهَا و الّا خانه را بصاحبخانه گذاشته تا قوت پای دارد برود و نگاه بعقب نکند - و مصر را سیر کند که دیدن دارد - اگر خواهد متوطّن شود در شام وطن نماید که نان و پنیر و خربزهٔ شیرین دارد اگرچه خوراک رافضیان است - اما اگر بدست میرزای مسلماني افتد بخورد که نقصاني بدینش نمي رسد - و در هندوستان چاقشور نپوشد و عاشق حرف خود نباشد - در مجلس با مردم طرف بحث نشود خصوصاً در باب مذهب - و مذهبی که دارد پوشیده دارد که مبادا اذیت بدني باو رسد - اگر نوکر پیشه باشد تا مدصبش پانصدي نشود مهمان در خانهٔ خود نبرد - در ایام پریشاني در خانهٔ اراذل مهمان نشود که عاقبت خفتی بظهور مي آید و قمار را به از تماشاهاي عالم داند - و حرف از ناموس کسی نگوید - با هر مجهولی مطایبه نکند - و مطایبهٔ هر کس را بخود راه ندهد - آشنایان را گاهی به بیند و خود را ننماید که مکرر مي شود - با صد روپیه ماهیانه ده روپیه

بقیمت کمرند و چپرۀ بادله بدهد. و اگر صاحب بدهد نفروشد که علامت خست است - اگر پنجاه روپیه بقیمت سمور بدهد اسراف نیست - در کنار نرد بازی عدم حرف نزند - و لولي در خانۀ غیر نبرد خصوصاً در جائی که استعداد دنیائي صاحب خانه بیش ازان باشد - و اگر چرکی بر روی مبارکش نشسته باشد از سرکه و نمک بشوید - و بغیر از درویش خاکی بدیگری اعتبار نکند - و در شعر خواندن حسن مطلع را بخواند اگرچه سهل باشد - مصرعی که بزبان دیگری جاري باشد مصرع دوم را ازان گرفته نخواند - و در هند اگر خانه بهم رساند طوآحی را موقوف کند و اول نظر بر استحکام خانه کند که در ایام برشگال بی اجل نمیرد - و در حمام بدن حجام ریش دار را بدن خود آشنا نکند و با پسر حجام ملایمت نماید - و درقلّۀ تنگی که مردم بسیار غوطه زده باشند در وقت بیرون آمدن از حمام چندی آب از خزانه بر سر بریزد گنجایش دارد - اگر خواهد خفت نکشد مرغی بالا نشینی را از سر دور کند - و در هند از مردم مندیل بزرگ بر سر توقع شعور نداشته باشد - اگر خواهد پشیماني و ندامت نکشد کیسه بر اختلاط مردم ندوزد که فلان بزرگ را خواهم دید و هزار روپیه بمن خواهد داد و بخشش بسیار خواهد کرد - و در هند طبیعت را بپالوده وفرني خانۀ مردم عادت مفرما که کاهلي و بیعزتي بار مي آورد - با منصب صدی سرپوش حقه و لجامِ اسپ را نقره ممکن که با میرزا نخواهد ماند - با سردار در اثنای راه و رفاقت همه جا پاس تفاوت او عنان اسپ را کشیده بدارد - امّا بسر پل چو رسد خود را پیش اندازد و بسلامت بر سر پل باز بقاعدۀ سابق سلوک نماید - و در ایام پریشاني در ظروف مس که کنار آن را کنده باشند طعام نخورد که چرک در ته او مي نشیند و بمجرد شستن پاک نمي شود - و بر در سرای سنبل خان اگر میسرش باشد حرف نزند که کج بحث در آنجا بسیار است - و از چند چیز خود را بر کنار کشد اگر خواهد که آزار نکشد - کسی اگر شروع بنقل طولاني کند مخاطب او نگردد که این مقدار را بندي خانۀ اختلاط گویند - و بآدم کج بحث طرف نشود که طاعون اختلاط است - تا تواند

خود را در قید اختلاط محمد صالح بیگ نویسنده و میرزا فضلي بیگ نیندازد - که کتاب کلیله و دمنه شمهٔ از آثار قدرت ایشان است - در مجلسی که مردم بسیار مهماي طلبیده باشند میرزا باید که زود تر از همه کس نرود - زیرا که اگر پیش از همه کس داخل شود با بسیار مردم باید تواضع کرد و این مقدمه را چار موجهٔ اختلاط گویند - بهر تقدیر اگر کسی را هوس میرزائي در سر افتد باین رساله رجوع نماید -

تمت

A REPORT ON THE BIOLOGY OF THE LAKE OF TIBERIAS.

First Series.

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2. Introduction to a Report on the Biology of the Lake of Tiberias.

By N. Annandale, D.Sc., F.A.S.B.

The papers to be published in this series are the result of five weeks' visit to Palestine and Syria in October and November, 1912. The object of the visit was, if possible, to trace the genera of sponges, coelenterates and polyzoa characteristic of the fresh waters of India and tropical Africa northwards up the Jordan valley, should they prove to have a distribution in any way similar to that of the Jordan fishes, whose African affinities have long been known. Collections of other invertebrates, more particularly the crustacea, worms and mollusca, were also to be made. For this purpose it seemed best in the limited time at my disposal to settle down at one place (rather than to attempt a survey of a wide area) and to carry out investigations as detailed as the period of the visit and a limited equipment would permit. Tiberias seemed the most convenient spot at which to stay, and I did not regret the decision to make it my headquarters, for, apart from its natural advantages, I received there the hearty co-operation of the resident European community, among whom I may mention in particular Herr R. Grossmann, the proprietor of the Hotel Tiberias and an ardent naturalist. I was also indebted for much valuable information to Dr. D. W. Torrance and the Rev. S. Semple.

I was provided with a twelve-inch dredge of the type supplied by the Marine Biological Association at Plymouth and with various tow-nets and hand-nets, but, although the dredge enabled me to obtain many specimens that would otherwise have remained in the lake, the greater and perhaps the more profitable part of my work consisted in the examination of stones round the margin and in the small springs or fountains for which the vicinity is celebrated. Numerous hauls of the dredge were made over the area extending from Tiberias southwards to the exit of the Jordan and thence eastwards to the village of Semakh: from Tiberias across the lake to Wad-es-Semakh on the western shore, and from the former place northwards to Mejdal or Magdala. The tow-net was used over this area both by day and by night and also at a point further north than any of the places hitherto mentioned, off the mouth of the Jordan. The fountains at Ain-et-Tineh and Tabghah were carefully examined and also the stream in the Wad-es-Semakh and the Jordan at its entry and exit, while a more cursory

investigation was made of the springs in the plain of Gennesaret. A few specimens were collected later in the R. Barada at Damascus and in the Dog River (Nahr-el-Kelb) near Beirut on my way to the coast, but only one day was devoted to collecting in each locality. A few blood-sucking and "house" flies were also obtained at Nazareth and at Kefr Kenna, half way between Nazareth and Tiberias, but no attempt was otherwise made to collect purely terrestrial animals.

The Lake of Tiberias (also known as the Sea of Galilee) is termed in modern Arabic Bahr Tubariya.[1] It is a pear-shaped mass of water through which the Jordan flows from north to south, its length being about 13 miles and its greatest breadth about $4\frac{1}{2}$ miles. Tiberias, the only town that now exists on its shores, is situated on the west side a little south of the broadest part. From a geographical point of view the most remarkable feature of the lake is that, like the greater part of the valley of the Jordan, it lies at a considerable distance below sea-level, its margin being no less than 680 feet below the surface of the Mediterranean. This fact gives it much the character of a mountain lake, as the hills around it are naturally much higher with reference to it than they are to sea-level. The depth of the lake is moderate, slightly exceeding 150 feet at two points only.[2] The shores are stony owing to the falling down from the steep hillsides round the edge of masses of rock. These hillsides are for the most part of basaltic formation, but at several points there are deposits of limestone, while near Semakh at the south end there are low cliffs of a sandy clay of recent diluvial origin. Round the mouth of the Jordan at the north end and in the plain of Gennesaret on the western shore there are considerable deposits of alluvium. The bottom of the lake is covered for the most part with fine black silt, but the stones extend outwards for a considerable distance from the shore.

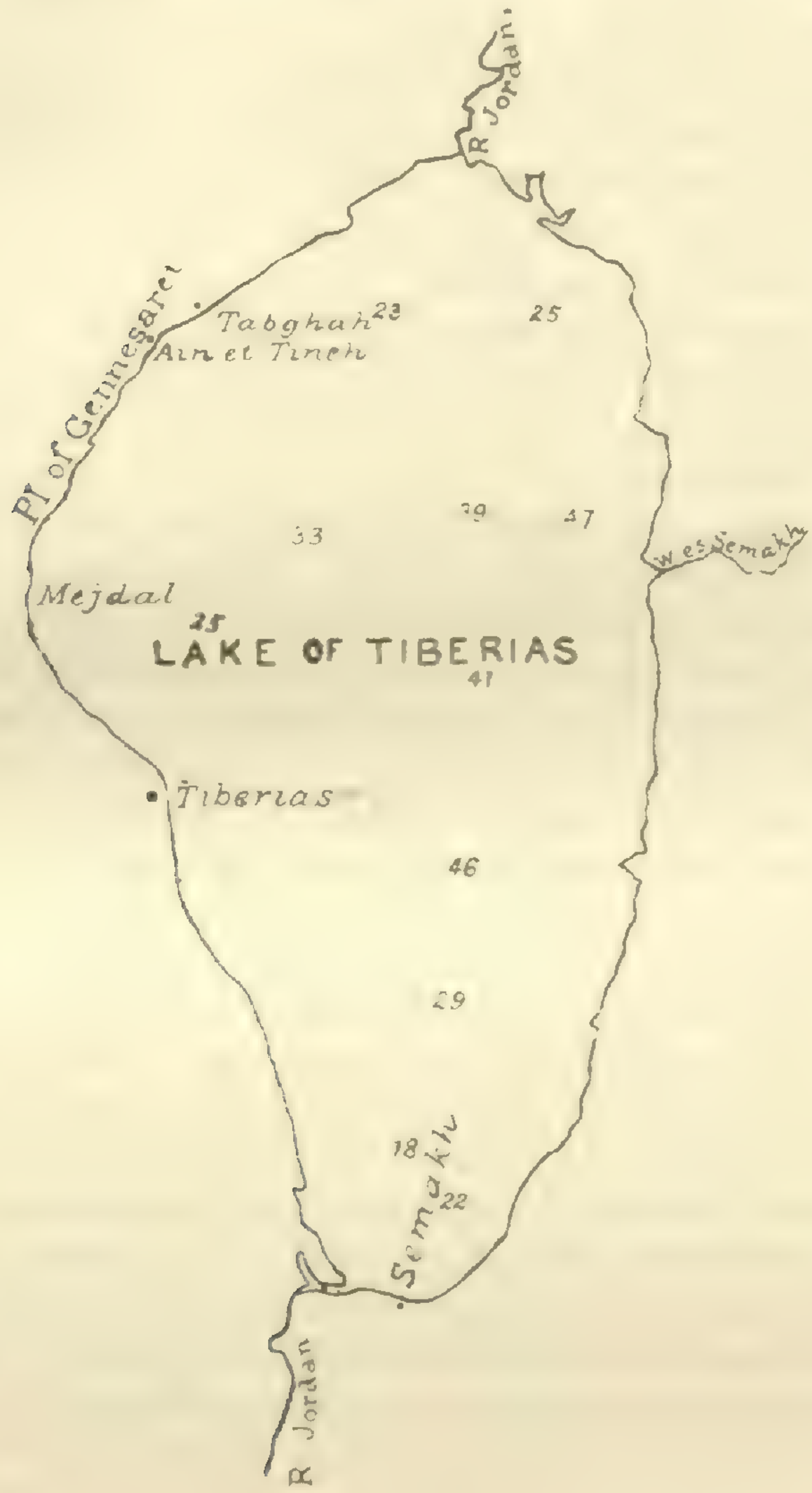
On maps of the lake numerous streams are depicted entering it. Most of these streams are, however, in summer either dry ravines or else merely the outflow of springs that rise at a short distance from the shore. The only permanent streams other than those produced by the springs are situated in the neighbourhood of the entry of the Jordan at the north-east of the lake and on the eastern shore, on which a brook flows down through the Wad-es-Semakh. Many of the fountains consist of more or less saline water and some of them are warm. Near Tiberias there are, on the margin of the lake, hot

[1] In this and other place-names I follow the spelling of Bartholomew's most recent map of Palestine.

[2] Recent surveys have not confirmed Lortet's statement that there are pockets of over 250 metres deep in the neighbourhood of the mouth of the Jordan. His statement as to the depths at which various species of molluscs occur are contradicted by my own investigations. See Lortet, *Arch. Mus. d'Hist. Nat. Lyon* III, pp. 104, 108.

sulphur springs, which have enjoyed, at any rate since the first century A.D., a reputation for their curative virtues.

The water of the lake itself is potable and forms practically the only supply to which the people of Tiberias have access. One artesian well sunk in the town produces a copious supply of water that can be drunk without ill-effect or unplea-



Sketch Map of the Lake of Tiberias, showing depths in metres.

santness, although it is slightly saline; but the water obtained from another boring only a few hundred yards away was strongly impregnated with brine. Dr. W. A. K. Christie has kindly promised to analyze samples of water I brought back, and I propose to discuss his analysis later.

The climate of Tiberias is practically tropical in character, the highest shade temperature recorded being 117° F.: in summer the shade temperature often reaches 110° F. and during

my visit in October it rose on several occasions to 106° F. The rainy season is in winter, the first heavy showers usually falling in October or November.

There is little vegetation round the lake either in the water or on the shore. In the water occasional beds of *Vallisneria*, *Potamogeton* and other (chiefly Ranunculaceous) water-plants occur in the shallows. On the beach there are at places clumps of oleander and thorny shrubs. The banks of the streams, whether true streams or merely the outflow of fountains, support a fairly dense growth of gigantic reeds and, if the water is fresh, permit thickets of willow, wild fig and Ricinus to flourish. In the pools themselves there is often a dense growth of Ranunculaceous water-plants.

Later I propose to discuss in detail the effects that local and geological conditions have had on the fauna : at present it will be sufficient to call attention to one or two of its most outstanding features.

As is the case with most if not all lakes the edges of which are covered with small stones, there is a marginal or intermediate fauna. This merges gradually into the true terrestrial fauna above, and into the true aquatic one below ; but some species are characteristic of it, notably certain oligochaete worms (Tubificidae and others), certain beetles, bugs, amphipodous and isopodous crustacea. A little lower down, where the greater part at least of the stones is entirely under water, the true lacustrine fauna makes its appearance ; other crustacea occur, and sponges, polyzoa and molluscs of several species are abundant. I was unable to find any evidence in favour of the view that the mollusca are distributed in regular zones in accordance with depth, but certain species (more particularly of the genera *Melania* and *Unio*) are more numerous in water of from 4 to 8 metres deep than just at the shore. The greatest depth at which I found a macroscopic fauna at all was 22 metres ; below this only microscopic organism were detected. Round the greater part of the lake the bottom slopes down gradually to this depth, up to which it is still covered with stones ; but off the plain of Gennesaret it is covered with finer gravel or coarse sand and slopes towards the deeper part much more gradually. This part of the lake has a poorer fauna than that to be found off Tiberias or Wad-es-Semakh, although immediately opposite the town the accumulation of organic débris has proved inimical to animal life.

Between the village of Semakh (which must not be confused with Wad-es-Semakh) and the exit of the Jordan there is a narrow strip of the lake that appears to have a peculiar fauna of its own. This strip, which was in October from 4 to 8 metres deep, represents the actual channel of the Jordan just before it leaves the lake. The bottom is covered with coarse grit and small pebbles, the finer silt being carried away by the current.

In the short distance (not more than two hundred yards) that intervenes between the channel and the southern shore, although the water is at some points nearly as deep as the channel itself, the sandy clay washed down from the cliffs, which are in a state of steady disintegration, interferes to some extent with animal life, to which the organic débris deposited immediately opposite the village is even more detrimental. Molluscs of the genus *Melania* are fairly common in a living condition in the channel just west of Semakh, but only their dead shells are to be found in the Jordan itself immediately on its exit from the lake. It was in the channel also that I dredged the only non-operculate gastropod molluscs seen in the lake, as well as the only polyzoon of the genus *Plumatella* and three of the four sponges of the subfamily Potamolepidinae obtained.

The zooplancton of the lake was not, at the time of my visit, abundant or conspicuous in any way. It consisted for the most part of minute copepods and rotifers, only a few species of each group being represented. In a few small muddy pools on the shore microscopic life was abundant, but none of the larger entomostraca were seen. Here again copepods predominated, but insect larvae of the families Culicidae and Chironomidae were well represented, as well as adult water-beetles and Rhynchota.

With one notable exception, the fauna of the fountains is not remarkable, although certain species and genera exist in them (and also in the Jordan at its entry and exit) that are rare in or absent from the lake owing to the fact that they live amongst dense vegetation near the surface of the water. This is the case with the little fish of the genus *Cyprinodon* and with the small Atyid prawn *Atyäephyra desmarestii*. Certain species of mollusca, moreover, seem to prefer, if not to be confined to, those springs that are decidedly saline, avoiding even approximately fresh water. By far the most notable inhabitant of any of the fountains is the blind prawn *Typhlocaris galilaea*, which is only found in one pool among the springs of Tabghah. Its habitat will be discussed later in a separate paper.

Fish and mollusca are certainly the most richly represented groups in the lake itself. The latter live to a large extent on the minute algae that are extremely abundant. The almost complete absence of non-operculate gastropod genera is a noteworthy feature. The higher crustacea are not well represented, the only common decapod being the crab *Potamon potamios*. Several species of the Amphipoda and Isopoda are, however, abundant round the edge.

Except in the small muddy pools already referred to, the only insect larvae at all common at the time of my visit were those of May-flies, which were found in large numbers under stones at the edge of the lake. Only two species of this group were, however, observed as adults, and even dragon-flies

were not numerous. Both culicine and anopheline larvae were observed in small springs on the shore, the former predominating in such situations, while the Culicinae were more often seen in chance accumulations of water or in small pools that had become separated off from the lake by desiccation. In the lake itself no culicids were taken, although chironomid larvae were dredged from considerable depths both by myself and by Lortet Adult water-beetles and Rhynchota were only found at the extreme margin and the only Diptera at all abundant, either in species or in individuals, on the lake in the winged stage were Chironomidae—or Tendipedidae, as some authors prefer to call them nowadays. From an entomologist's point of view, however, October is a "dead" season in Palestine.

Worms, in the wide sense of the term, are not well-represented in my collection. Several species both of Tubificidae and of larger Oligochaeta were found in the wet mud under stones in the marginal region, but unfortunately most of them were immature at the time of my visit. A predaceous leech (*Dina*, sp.) that fed on worms was very abundant in the same region. Barrois found a small black planarian common under the stones at the edge of the lake in May, but in October I could find no representative of the group in this position, although at least two species were common in small streams on and near the shore.

Two species of Polyzoa Phylactolaemata and five of tresh-water sponges were obtained. The only coelenterate I saw was a single specimen of the common Green Hydra (*H. viridis*, Linn.), which I found among weeds in a little limestone basin at Ain-et-Tineh.

Several distinguished naturalists, among whom the names of Günther, Tristram, Lortet and Locard are prominent, have devoted their attention to the fish[1] and molluscs of the Lake of Tiberias, and although the less conspicuous groups have not been so strictly investigated, the collections of Dr. Th. Barrois and Dr. E. Festa have provided material for two valuable series of papers by various authors in the *Révue Biologique du Nord de la France* and the *Bolletino du Musei di Zoologia ed Anatomia comparata della R. Universita di Torino* respectively.[2] The two series were published almost simultaneously, between 1892 and 1896. References to the different papers will be given in the corresponding contributions to this series,

[1] Dr. E. W. G. Masterman of Jerusalem has published a very interesting account of the inland fisheries of Galilee, including those of the lake, in his *Studies in Galilee* (Chicago: 1909).

[2] Only a comparatively small number of Dr. Festa's specimens were actually from the Lake of Tiberias.

for help in the preparation of which I have to thank a number of naturalists in Europe and America as well as in India. I have also to thank the Council of the Asiatic Society of Bengal for publishing the papers in separate instalments and for liberal treatment in other respects.

EXPLANATION OF PLATE I.

Photographs of the Lake of Tiberias.

Fig. 1. View on the western shore, looking north : to show the loose stones on the lower surface of which *Ephydatia fluviatilis syriaca*, *Nudospongilla mappa* and ***Fredericella sultana*** occur.

Fig. 2. A corner of the city-wall of Tiberias jutting out into the lake. The upper margin of the pale streak on the wall represents the level attained by the water in winter The photograph was taken in the middle of October, before the rainy season had commenced.

Fig. 3. Outflow of a small spring in the Plain of Gennesaret (October) : to show the pebbly beach.

Fig. 4. Outflow of the Jordan, looking towards the village of Semakh from the western bank of the river. The strip of water shown outside the actual exit, which is well defined by projecting spits, is the only known habitat of the sponge *Cortispongilla barroisi* (Topsent) and other endemic species.

3. The Composition of the Water of the Lake of Tiberias.[1]

By W. A. K. Christie, B.Sc., Ph.D.

The sample of water from the Lake of Tiberias whose analysis is given below was collected by Dr. Annandale at 7-30 a.m. on October 27th, 1912, a mile south of Tiberias. It was taken at the surface from a steamer plying on the Lake.

One true liter contains the following inorganic constituents in grams, the results being expressed in the ionic form.

Na	..	0·121
Mg	..	0·023
Ca	..	0·049
Cl	..	0·239
SO_4	..	0·016
CO_3	..	0·075
SiO_2	..	0·013
Total	..	0·536

Its salinity is 536 parts per million, its specific gravity 1·00043 $\left(\frac{24^\circ}{24^\circ}\right)$ or 0·99775 $\left(\frac{24^\circ}{4^\circ}\text{ in vacuo}\right)$.

The amount of water collected for analysis was unfortunately insufficient for an exact or detailed examination, and minor constituents, potassium, bromine, etc., though possibly present, could not be determined. Though the results are far from perfect analytically, and though the composition of the lake water will undoubtedly vary with the locality of the sampling place and the time of year, the figures are sufficiently accurate to show how remarkably the water of the Lake of Tiberias differs from that of other lakes with an outflowing stream, and from that of rivers, with which the water from lakes with an outlet has of course many similarities. The prevailing characteristics of analyses of ordinary lake and river waters are a high percentage of carbonate and of calcium, and a low percentage of chloride and alkalies. Here we have the reverse. The composition of this water resembles that of no other river or lake with an outflow of which I have found data, with the exception of some of the rivers flowing from arid saline regions in the middle of the United States, and of the Jordan itself. On the

[1] Published with the permission of the Director, Geological Survey of India.

other hand, the composition of its soluble constituents resembles that of the reservoirs of many enclosed basins—where chlorides predominate over carbonates and alkalies over calcium; and though its salinity is much less than is generally the case with waters which accumulate in areas of internal drainage, it is still considerably greater than that of the average lake with an outflow. The water of the Caspian Sea may be taken as an example for comparison. A is the mean of five analyses by C. Schmidt [1] of water collected off Baku, B is one by H. Rose [2] of water collected 80 kilometers S.-W. of the outermost delta island of the Volga, and C is the above analysis of Tiberias water, all calculated to the same percentage form.

	A. Caspian (Schmidt).	B. Caspian (Rose).	C. Tiberias.
Na	24·70		
K	·54	23·6	22·6
Rb	·02		
Mg	5·97	3·9	4·3
Ca	2·29,	9·5	9·1
Cl	42·04	34·5	44·6
Br	·05		
SO_4	23·99	19·5	3·0
CO_3	·37	9·0	14·0
SiO_2	·03	—	2·4
	100·00	100·0	100·0
Salinity (parts per million)	12940	1320	536

The salinity in the southern part of the Caspian is much greater than that of the Sea of Galilee, and even in the north, where the water is diluted by the Volga and the Ural, it is 2½ times as great, but with the exception of the replacement of carbonates by sulphates the analyses resemble one another reasonably closely.

The immediate reason for the peculiar composition of the water of the Lake of Tiberias is not far to seek, if the water from the springs at Tiberias is at all representative of many of its other sources of supply. An analysis of the water from one

[1] Bull. Ac. Sc. St. Petersburg, *24*, (1878), p. 177. Analyses recalculated by F. W. Clarke, Bull. U. S. Geol. Surv., *491*, (1911), p. 154.

[2] Poggendorff's Annalen, *35*, (1835), p. 183.

of these springs, Birket el Ezair, is given by M. Blankenhorn.[1] The sample was taken in April.

Reduced to the percentage ionic form, the results are—

Na	..	30·08 %
Ca	..	7·88 %
Cl	..	52·90 %
SO_4	..	4·64 %
CO_3	..	3·38 %
SiO_2	..	1·12 %
		100·00

The salinity is 3544 parts per million. Another analysis is given by Blankenhorn (loc. cit., p. 344) of water from the octagonal pool described below or from the stream stated to flow out of it. Recalculated to the same form, it is—

Na	..	30·7 %
Ca	..	8·1 %
Cl	..	47·3 %
CO_3	..	12·1 %
SiO_2	..	1·8 %
		100·0

The salinity is 1350 parts per million. This pool is the only known locality of the blind prawn *Typhlocaris* and a sample for analysis was therefore collected by Dr. Annandale on October 23rd, 1912. His description of the place is as follows:—

"The octagonal pool in which *Typhlocaris* occurs is situated about 200 yards in a direct line from the edge of the Lake of Tiberias, in a little plain containing other springs of varying salinity and temperature; it is probably the largest pool in the immediate neighbourhood of the lake. The circumference (if the eight sides be equal, as is apparently the case) is 58 metres, and the greatest depth of water is stated to be in spring about 3 metres; in October it was 6 to 10 cm. less. The local name of the pool is Birket 'Ali edh Dhaher, 'Ali edh Dhaher having been a local robber-chief of the eighteenth century, who is said to have repaired many buildings in the neighbourhood of Tiberias. A description of the pool is given in vol. I of the *Memoirs of the Survey of Western Palestine*, another in the unabridged editions of Thomson's *Land and the Book*, and a third in Masterman's *Studies in Galilee*. The water is entirely enclosed in walls that are clearly of two different dates, the lower part being of large well-dressed stones, and the upper of much smaller and more irregular stones covered with plaster, of which remains still exist.

[1] "Wissenschaftliche Studien am Toten Meer und im Jordantal," p. 344. Berlin, 1912.

The lower part may be Roman, as I am inclined to believe; but some authors regard it as good mediaeval Arabic work. The name of the place is et-Tabgha, which recent authorities believe to be a corruption of the Greek Heptapegon ("seven springs").

All the authors consulted state that the copious spring that gushes out at the base of the little eminence on which the octagonal pool is situated, and still works a corn-mill close to the shore of the lake, is an outflow from the pool; but of this I could obtain no evidence. So far as I could discover, the water of the pool was quite stagnant, and I could detect no outflow. Some six or eight feet above the present water-level, however, there are two circular holes in the wall from which it is evident that at one time water flowed from the pool to work a water-mill or water mills in a totally different direction from that of the existing water-course. There is, indeed, evidence that the distance to which this water was conducted was different at different periods. I believe that now, whatever may have once been the case, there is no connection between the pool and the lake. In October, 1912 the whole surface was overgrown with floating grasses of great size.

At 11 a.m. on October 22nd, the air-temperature immediately above the surface of the water in the pool being 30°C., the water itself at the surface had a temperature of 27°C. At the same time that of the existing mill-race, at the point at which it issued from the ground, was 25°C., all being in the shade. Bubbles of gas were observed ascending almost continuously from the bottom of the pool at this time, but no smell could be detected."

The specific gravity of the water is 1·00295 $\left(\frac{24^\circ}{24^\circ}\right)$ or 1·00026 $\left(\frac{24^\circ}{4^\circ}\text{ in vacuo}\right)$, the salinity 3710 parts per million.

One true liter contains, in grams,

Na	..	·901
K	..	·0576
Mg	..	·0874
Ca	..	·3538
Cl	..	2·074
SO_4	..	·0251
S	..	·0248
CO_3	..	·171
SiO_2	..	·0260
Total	..	3·7207

The percentage composition of the inorganic matter in solution is given below.

Na	..	24·21 %
K	..	1·55 %
Mg	..	2·35 %
Ca	..	9·51 %
Cl	..	55·74 %
SO_4	..	·67 %
S	..	·67 %
CO_3	..	4·60 %
SiO_2	..	·70 %
		100·00

Though the assumption of the presence of definite salts in such a solution is purely arbitrary, it may be pointed out as an interesting feature that the chloride is sufficient in quantity for combination with all the sodium, potassium and magnesium and 60% of the calcium besides,—it is in fact a very chloridic water. It contains too a notable amount of sulphide, more than the European balneologist considers necessary for the designation "sulphur spring." In composition and salinity this water resembles that represented by M. Blankenhorn's analysis of Birket el Ezair water much more closely than it does the sample collected by him on the same day from the Birket Ali edh Dhaher or, as he calls it, el-Hasil. The similarity of all three analyses with that of the lake water is sufficiently obvious.

The strata from which these springs take their rise must be very saline in character, and it may well be that they represent the leachings of the deposits of the inland sea which, according to E. Hull,[1] filled the present Jordan Valley in Pliocene times.

[1] "Geology and Geography of Arabia Petraea, Palestine and adjoining Districts," p. 79 *et seq.*, London, 1889.

4. Notes on the Fishes, Batrachia and Reptiles of the Lake of Tiberias.

By N. Annandale, D.Sc., F.A.S.B.

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It was not part of the plan of my visit to Palestine to collect vertebrates of any kind and only a few specimens were obtained incidentally; but it will be convenient to commence this series by considering the aquatic vertebrates of the lake, although the papers will be devoted mainly to the invertebrates, about which there will be more that is strictly original to be said.

I. FISHES.

(*a*) An analysis of the Fish-Fauna.

The following list is compiled for the most part from well-known works, among which I may mention in particular Günther's paper on reptiles and fish from Palestine in the *Proc. Zool. Soc.* for 1864, Lortet's "Poissons et Reptiles du Lac de Tiberiade" (*Arch. Mus. d'Hist. Nat. de Lyon* III, 1883), Tristram's *Fauna and Flora of Western Palestine* (1888) and Boulenger's *The Fishes of the Nile* (1907) and *Catalogue of the Freshwater Fishes of Africa* (1909-10).[1] The two last works in particular have been of the greatest use in settling the somewhat complicated synonomy of genera and species, although they refer only to African fish. I have added to this compilation a few notes on species actually observed and have analyzed the geographical distribution of the fish in some detail, leaving all discussion of origins for a later paper.

List of the Fish of the Lake of Tiberias and the neighbouring Fountains.

Fam. Blenniidae.

1. *Blennius varus*, Risso.
2. *B. lupulus*, Bonap.

Fam. Cyprinidae.

3. *Discognathus lamta rufus*, Hckl.
4. *Varicorhinus damascinus* (C. & V.)
5. *V. syriacus* (Gthr.)
6. *V. socialis* (Hckl.)
7. *V. sauvagei* (Lort.)
8. *Barbus canis*, C. & V.
9. *B. beddomei*, Gthr.
10. *B. longiceps*, C. & V.
11. *Leuciscus zaregi*, Hckl.
12. *Alburnus sellal*, Hckl.
13. *Nemachilus galilaeus*, Gthr.

[1] Owing to the delay that takes place in the distribution of certain French periodicals, Dr. Pellegrin's account of the fish collected in Syria by M. Gadeau de Kerville is not yet (March, 1913) available for reference in Calcutta.

Fam. CYPRINIDAE (*continued*).

14. *N. leontinae*, Lort.

Fam. SILURIDAE.

15. *Clarias lazera* (C. & V.)

Fam. CYPRINODONTIDAE.

16. *Cyprinodon richardsoni*, Blgr.
17. *C. sophiae*, Hckl.
18. *C. mento*, Hckl.

Fam. CICHLIDAE.

19. *Hemichromis sacra*, Gthr.
20. *Paratilapia magdalenae* (Lort.)
21. *Tilapia zillii* (Gervais).
22. *T. nilotica* (Hsslqt.)
23. *T. galilaea* (Artedi).
24. *T. simonis* (Gthr.)
25. *T. flavi-josephi* (Lort.)

The twenty-five species in the foregoing list can be separated into four geographical categories as follows :—I. "Palestinian" species, that is to say species that do not occur east, west or south of Palestine or north of Asia Minor : II. "African" species, found neither in Europe nor east or north of Syria in Asia : III. "Asiatic" species, found in Mesopotamia or further east but not in Africa or on the shores of the Mediterranean : IV. "Mediterranean" species that occur in European streams entering the Mediterranean but have not been found east or south of Palestine. The various species may be tabulated as follows :—

I. PALESTINIAN SPECIES.

Fam. CYPRINIDAE.
Varicorhinus socialis.
V. damascinus.
Barbus canis.
B. beddomei.
B. longiceps.
Leuciscus zareji.
Nemachilus galilaeus.
N. leontinae.

Fam. CYPRINODONTIDAE.
Cyprinodon richardsoni.

Fam. CICHLIDAE.
Hemichromis sacra.
Paratilapia magdalenae
Tilapia simonis.
T. flavi-josephi.

II. AFRICAN SPECIES.

Fam. CICHLIDAE.
Tilapia zillii.
T. nilotica.
T. galilaea.

Fam. SILURIDAE.
Clarias lazera.

III. ASIATIC SPECIES.

Fam. CYPRINIDAE.
Discognathus lamta.
Varicorhinus syriacus.

Fam. CYPRINODONTIDAE.
Cyprinodon sophiae.
C. mento.

IV. MEDITERRANEAN SPECIES.

Fam. BLENNIIDAE.
Blennius varus.
Blennius lupulus.

A glance at these lists will show that there is a considerable endemic element in the fish-fauna of Palestine, represented by no less than fourteen of the twenty-five species known from the Lake of Tiberias. We may further divide the species named under the first heading as follows :—

(*a*) Species only known from the lake and the surrounding fountains :—*Varicorhinus sauvagei*, *Barbus beddomei*, *Leuciscus zaregi*, *Nemachilus galilaeus*, *N. leontinae* and *Hemichromis sacra* (6 in all).

(*b*) Species only known from the Jordan system :—*Varicorhinus socialis*, *Barbus canis*, *B. longiceps*, *Tilapia simonis* and *T. flavi-josephi* (5 in all).

(*c*) Species of wider range in Syria and Palestine :—*Varicorhinus damascinus*, *Alburnus sellal* and *Paratilapia magdalenae* (3 in all).

Most of the species apparently confined to the lake are small, inconspicuous or exceedingly rare, and although it is possible that its depths may provide a suitable habitat for species which cannot exist in any other part of the Jordan system, there is no reason to regard the fish-fauna of the lake as distinct in any very marked manner from that of other parts of the system with which it is in direct communication. Only a small proportion of the endemic species, however, have succeeded in extending their range beyond the Jordan, its affluents and its lakes.

The African element in the fish-fauna of Palestine is the one that has hitherto attracted most attention. As will be evident when the genera are discussed, it is by no means confined to the few species actually common to Africa and Syria.

Three of the Asiatic species occur in Mesopotamia as well as in Syria, but one (*Discognathus lamta*) has a much more extraordinary range, various races being common in all parts of India in which rocky streams are present. The race that occurs in the Lake of Tiberias is not, however, identical with the typical Indian form of the species or even with that of the North-West Himalayas.

The two Mediterranean fish belong to a genus whose members frequent the extreme margin of streams and of the sea and are in some cases almost amphibious in habit.

Five families of fish are represented in the Lake of Tiberias,—the Blenniidae, the Cyprinidae, the Siluridae, the Cyprinodontidae and the Cichlidae. Neither the Holarctic Salmonidae [1] nor the Ephiopian Mormyridae extend into it or

[1] A trout (*Salmo trutta macrostigma*) occurs at Smyrna but does not make its way southwards into Syria, although it occurs at Teheran in Persia and also in North Africa. See Boulenger, *Ann. Mag. Nat. Hist.* (6) XVIII, p. 153 (1896), and *Cat. Freshwater Fishes of Africa*, I, p. 167, fig. 132 (1909).

into any part of the Jordan system, and all the families that do occur have a wide range in different geographical regions: except the versatile Siluridae and Blenniidae, they are essentially freshwater fish. The Cyprinidae are found all over the world except in South America and Australasia; the Cyprinodontidae are common in all warm and tropical parts of both Americas and occur in less abundance in the corresponding parts of the Old World; while the Cichlidae are mainly a tropical group, distributed through the warm parts of both Hemispheres, except in Australasia and the east of Asia. One genus (*Etroplus*) is found in India and Ceylon. The Siluridae include many freshwater species in their ranks, and some of the blennies frequent brackish, a few fresh water. The Galilean species are among these few, in Europe as well as in Palestine. There is, therefore, no marine element in the fish-fauna of the Lake of Tiberias, unless *Blennius lupulus* and *B. varus* be regarded as comparatively recent immigrants from the Mediterranean Sea, a view that has little evidence to support it.

There is no endemic genus of fish in the Jordan system. Perhaps the most interesting genera that have been found in this system are those that belong to the family Cichlidae, namely *Hemichromis*, *Paratilapia* and *Tilapia*. These are characteristic African genera. *Hemichromis* is thought by Günther[1] to be of West African origin and only one species makes its way into the Nilotic system. This species (*H. bimaculatus*) is recorded from several localities in West Africa and the Algerian Sahara as well as from the White Nile and Lake Mareotis. The endemic species in the Lake of Tiberias (*H. sacra*) is quite distinct from the Nilotic one. In the opinion of Mr. Boulenger "*Hemichromis* passes completely into *Paratilapia*,"[2] which, unlike the true *Hemichromis*, is found in Madagascar as well as in continental Africa. *Chromis* is essentially a tropical African genus, occurring on both sides of the continent and making its way down the Nile and up its various tributaries.

Among the Cyprinidae the genus *Varicorhinus* is to some extent analogous in its distribution to the Cichlid genera discussed in the last paragraph, for it is widely distributed in the Ethiopian region but otherwise confined to the middle part of Asia. Both in Africa and in Asia, however, it has a wider range than either *Tilapia* or *Hemichromis*, for it is found on the one hand in Central Asia (as well as in Syria and Asia Minor)

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[1] *An Introduction to the Study of Fishes*, p. 229 (1880). Mr. Boulenger tells me that he places the species here called *Hemichromis sacer* in *Paratilapia*. My only reason for placing the species *magdalenae* in *Paratilapia* is the appearance of the head in fig. 2 on plate IX of Lortet's monograph, in vol. III of the *Archives du Muséum d'histoire naturelle de Lyon*.

[2] *Fishes of the Nile*, p. 460.

and on the other has penetrated as far south as South Africa. *Barbus* is widely distributed in Asia and Africa but occurs also in Europe; in Asia it is most richly represented in the tropical regions into which *Varicorhinus* has not made its way. *Alburnus* is Palaearctic and *Leuciscus* Holarctic, while *Nemachilus* is a widely distributed European and Asiatic genus that includes many species from Central Asia, the Himalayas, India and Burma, but is only represented in Africa by a single Abyssinian form. The genus is therefore essentially Palaearctic and Oriental in its range. The one Silurid genus in the list (*Clarias*) includes a large number of African species, many but not all of which are tropical, and is also represented, much less richly, in tropical Asia.

Cyprinodon is best represented as a genus in the southern parts of North America, in Central America and in the northern parts of South America. Species, however, occur all round the Mediterranean basin, in Africa, and in western, central and eastern Asia. One form (*C. dispar*) closely allied to *C. richardsoni* is found as far south as Sind, occurring also in north-eastern Africa and south-western Asia The other two Syrian species were described from Mesopotamia. Several others are known from Persia, but in Peninsular India the genus is replaced by *Haplochilus* and *Panchax*. Some authors[1] separate the African and Asiatic species under the name *Lebias* from *Cyprinodon s.s.*, which they retain for American forms; but there is little justification for this course.

The striking features of the fish-fauna of the Jordan system, which is, as it were, concentrated in the Lake of Tiberias, are clearly shown in the foregoing analysis of its species and genera. I defer all discussion as to its origin to a final paper in which the fauna of the lake as a whole will be discussed.

(*b*) Notes on species observed.

The following are a few notes on species actually examined. I am much indebted to the assistance of Mr. B. L. Chaudhuri in their preparation.

Blennius varus, Risso.

This little fish is extremely common at the very edge of the lake, where it hides among small stones the upper surface of which is frequently dry. On two occasions (in October) I found what I take to be its eggs. They were deposited in a flat mass, sometimes one egg and sometimes several eggs deep, on the lower surface of a stone, and on each occasion an adult blenny was observed apparently on guard just outside the

[1] See Gorman, *Mem. Mus. Comp. Zool. Harvard* XIX, 29 (1895).

cavity formed by the stone and the bottom. Unfortunately I was unable to catch either of these fish. One lot of eggs was seen off the mouth of the stream of the Wad-es-Semakh, the other just off the exit of the Jordan. In each case the water was less than two feet deep.

Discognathus lamta (Ham. Buch.)

Race *rufus* Heckel.

Specimens of *D. lamta* caught in the octagonal pool at Tabghah belong apparently to the form described by Heckel under the name *Discognathus rufus*. In Hamilton's original description of the fish he called *Cyprinus lamta* there is nothing that would serve as a basis for separating the two forms, but a careful comparison of specimens from northern Bengal (fig. 2) (as the Province was formerly constituted) and my Syrian examples (fig. 3) brings out the following differences :—

(1) In the Bengal form the anterior barbel is distinctly longer than the posterior, while in the Syrian race the posterior barbel is usually the longer of the two.
(2) In the Bengal form the sucker formed by the lower or posterior lip is almost semicircular, while in the Syrian race it is subtriangular.
(3) In the Bengal form the anterior lip is broader and the mouth situated further back than in the Syrian race.
(4) The dorsal profile of the Bengal form is distinctly flattened on the head, while in the Syrian it forms an almost regular curve from the anterior extremity of the dorsal fin to the tip of the snout.
(5) The ventral profile in the Bengal form is almost straight, while in the Syrian one it is distinctly sinuous, becoming markedly concave between the pectoral and the pelvic fins.

As Mr. Boulenger points out, the Asiatic species of *Discognathus* are in need of revision. At least four races occur in the Indian Empire, *viz.* the typical form (fig. 2) from northern Bengal and Bihar, the form common in the W. Himalayas and the Punjab Salt Range, one common in the hills of northern Assam, and an undescribed form from Manipur. The common Assam form[1] is distinguished from the others by the small size of its eye and by the fact that the barbels are practically equal. The snout of the male is constricted in

[1] This is probably McClelland's *Platcara nasuta*, of which Day's *Discognathus modestus* is perhaps the female.

front of the eyes. In the W. Himalayan race the snout of the male develops a remarkable hook-shaped and tuberculate appendage of which traces can be detected even in young specimens. In the typical form from Bengal no such appendage is produced and the snout is not strongly constricted, although it becomes tuberculate in the adult male. An undescribed form from Manipur has the whole of the ventral surface devoid of scales and exhibits marked peculiarities in colouration. Günther's *D. macrochir*, also from Assam, probably represents a fifth race; in it the belly is bare as far back as the base of the pelvic fins and the pectoral fins are greatly elongated. The

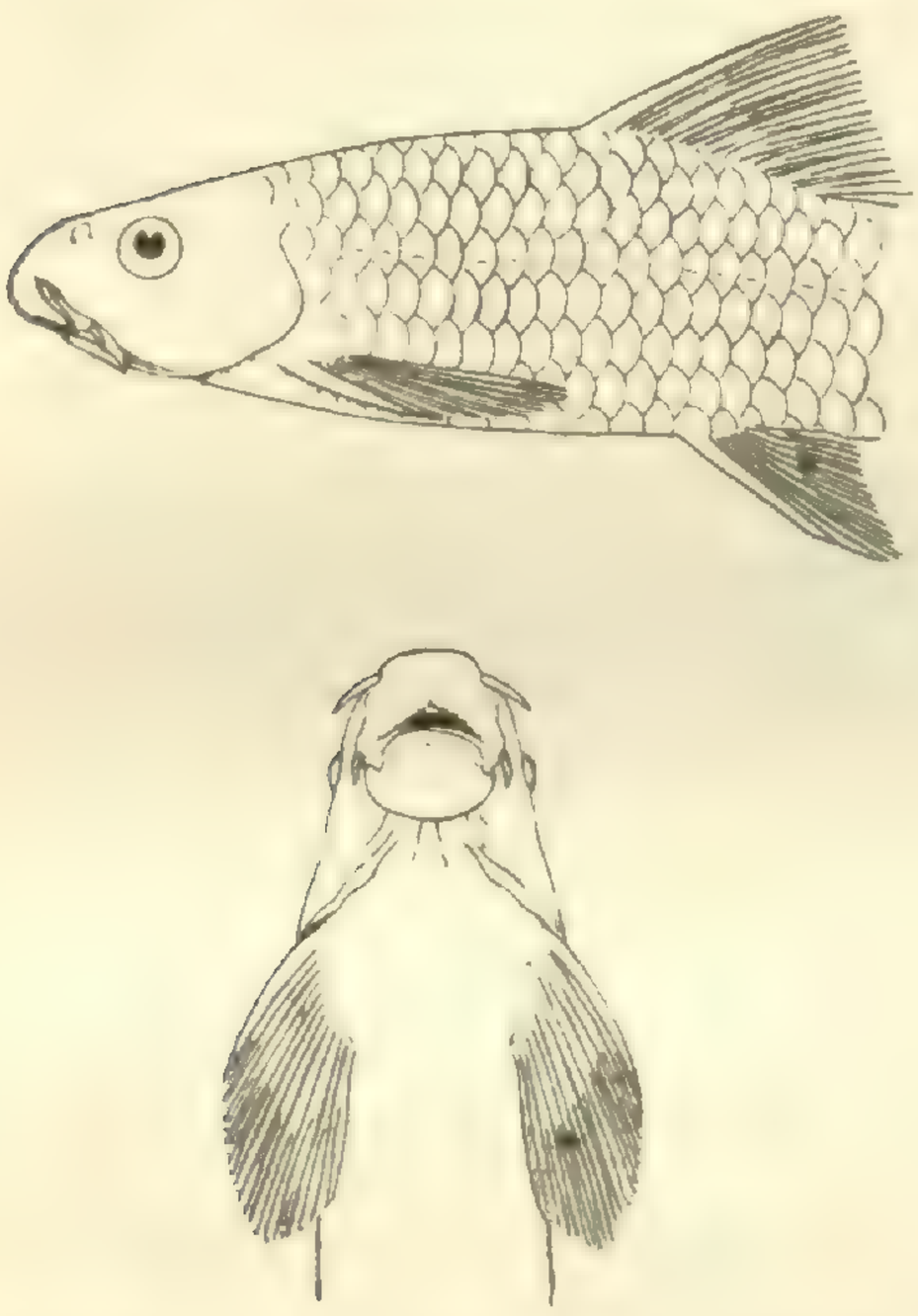

FIG. 1.—*Discognathus lamta* (H. B.), *forma typica* from Chota Nagpur.

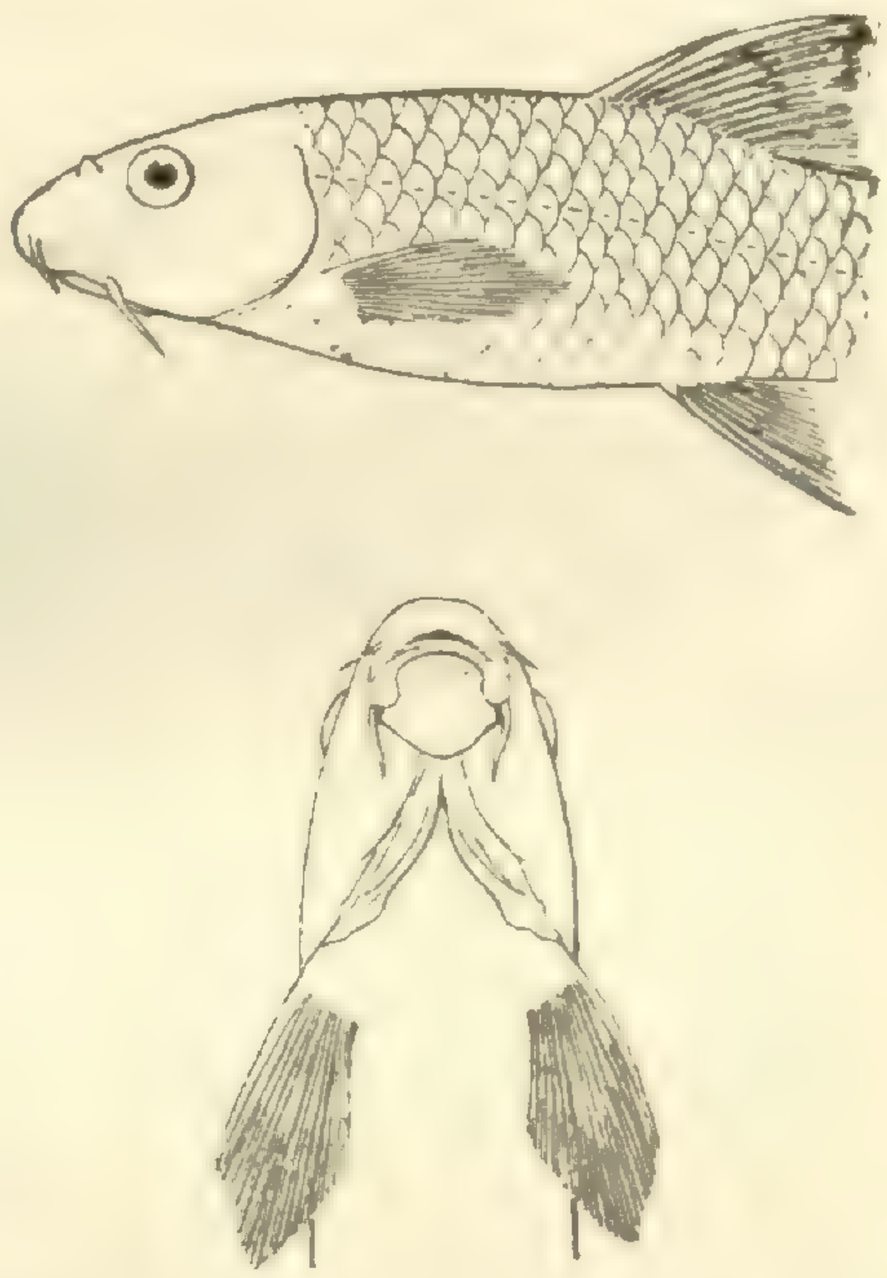

FIG. 2.—*Discognathus lamta rufus*, Heckel, from Tabghah, Galilee.

race that occurs near Aden is apparently very like if not identical with that of the W. Himalayas.

The typical form of *D. lamta* is a dweller in rapid-running streams, in which its labial sucker is of great use in enabling it to adhere firmly to the bottom or sides. In the fountains round the Lake of Tiberias, however, the race *rufus* lives for the most part in still water. If a man puts his bare feet into the water the fish frequently clings to them by means of the sucker and apparently attempts to suck or nibble at the skin. Owing to the fact that the mouth is ventral, *Discognathus* cannot seize any food that is not lying on the bottom, without turning over on its back. In the pool at Tabghah numbers of individuals attacked the bones of chickens and pigeons that were thrown into the water fastened to

strings, often turning over in order to nibble at them. A dead fish of their own species was thrown in in two pieces. At first they left it alone, but after about half an hour attacked and devoured it. They appeared to be unable to carry off any but the smallest particles bodily.

As has already been pointed out *D. lamta* includes several local races in India, Assam and Burma and also occurs in southern Arabia. The form common in Mesopotamia, and also in the Helmand basin, is not *D. lamta* but *D variabilis*, Heckel, a very distinct species as species go in the genus. *D. variabilis* is also found in Syrian rivers. The form from Abyssinia referred by Blanford[1] to *D. lamta* has been separated therefrom by Boulenger[2] under the name *D. blanfordi*. It would seem probable that a race or races of *D. lamta* occur in central Arabia, but the ichthyology of that country is still unknown and all that we can say is that one race is found in Syria and Palestine, another, probably identical with one from north-

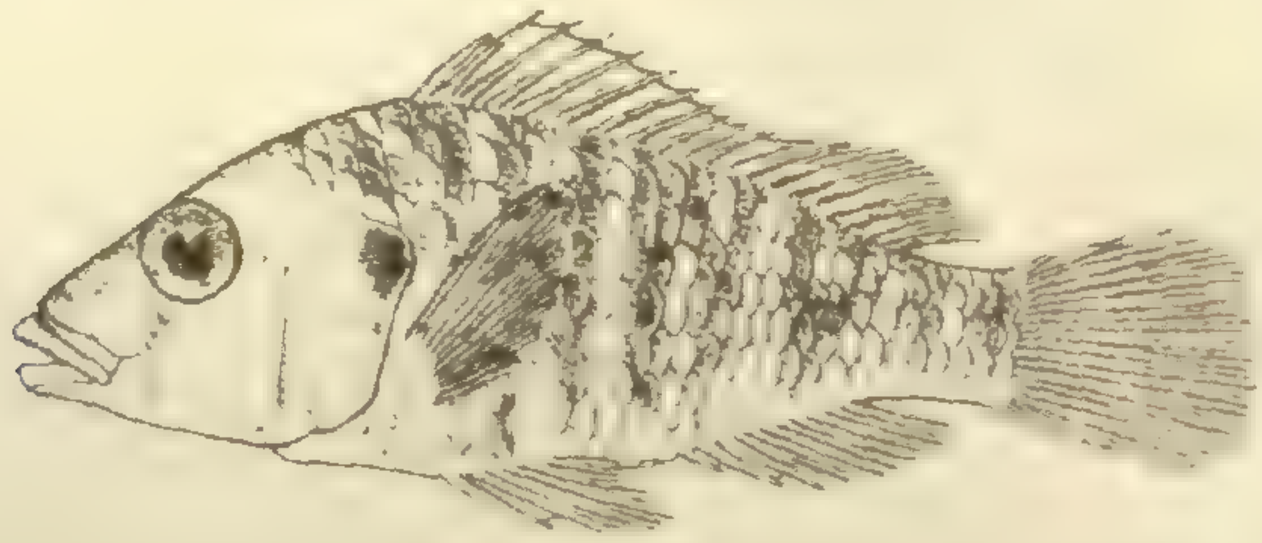

FIG. 3.—Young of *Hemichromis sacer* (nat. size).

western India, near Aden, and others in Bengal, Assam and Burma.

Hemichromis sacer, Günther.

A young individual (fig. 4) of this species was taken in one of the limestone pools at Ain-et-Tineh. As this species is said to breed in June[3] my specimen was probably about four months old. It measures 53 mm. in total length and is relatively deeper than the adult fish. The snout is also less prominent. The colour is silvery grey and there are nine or ten vertical dark bars on each side of the body. Those on the caudal peduncle are somewhat indistinct. The fin-membranes are greyish, faintly marbled with white on the dorsal fin. There is a black spot on each operculum.

The only other fish of which I obtained specimens were *Clarias lazera*, *Cyprinodon richardsoni*, *C. mento*, *C. sophiae*,

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[1] *Geol. Zool. Abyssin.*, p. 460 (1870).

[2] *Proc. Zool. Soc.* 1901 (ii), p. 160: 1903 (ii), p. 330, pl. XXXI, fig. 2: *Cat. Freshwater Fishes of Africa* I, p. 349, fig. 263 (1909).

[3] Tristram, *Faun. Flor. Palest.*, p. 168. Lortet, *Arch. Mus d'Hist. Nat. Lyon* III, p. 149.

Tilapia zillii and *T. niloticus*. The three Cyprinodonts are common among water-weeds in the Jordan both at its entry into and its exit from the lake and also in the pools at Ain-et-Tineh. I did not see them in the lake itself. Together with them, in each locality, specimens of the little Atyid prawn *Atyaëphyra desmarestii* were taken.

II. BATRACHIA AND REPTILES.

The following notes are based on a few specimens taken incidentally and on a collection generously presented to the Indian Museum by Herr R. Grossman of Tiberias.

(*a*) Aquatic Species.

The list of aquatic or rather amphibious reptiles and batrachia that inhabit the shores of the Lake of Tiberias is a short one, and I have no species to add. It comprises only the following names :—

Rana esculenta ridibunda, Pallas.
Hyla arborea savignyi, Audouin.
Bufo viridis, Laur.
Clemmys caspica rivulata, Valenc.
Emys orbicularis (Linn.).

With one exception (that of the tree-frog), these forms occur in south-eastern Europe; while two of them have also a wide distribution in western and central Asia—*Rana esculenta ridibunda* and *Bufo viridis*. The range of the former extends over the greater part of Europe and North Africa and also through Persia, Afghanistan and central Asia: that of the latter is even more extensive, including Kashmir and north-western India. *Hyla arborea savignyi* is common throughout Asia Minor and Syria and has also been found in Egypt ; the species of which it is a race has, like *Rana esculenta*, a habitat only limited to the south by the Himalayas and other mountain ranges of south-eastern Asia and to the north by cold, otherwise including the whole of the Old World. *Clemmys caspica rivulata* is found in S. E. Europe, Asia Minor, Syria and northern Palestine, being replaced in Persia by the typical form of the species *Emys orbicularis* is common in southern and eastern Europe, the adjacent parts of Asia as far as the Caspian Sea and the western part of North Africa, but apparently does not occur in Egypt or in Asia south of Palestine.

Of the two African amphibious reptiles (*Crocodilus niloticus*, Laur., and *Trionyx triunguis*, Försk.) that occur in Palestine proper and in Syria, neither has been reported to exist in the Lake of Tiberias, and I could obtain no evidence of their occurrence, although the mud-turtle has been found as far north

as Beirut.[1] The crocodile is only known from a few localities, especially the Zarka or Crocodile River in the Plain of Sharon.

Although at least two species of urodele (*Salamandra maculata*, Linn., and *Molge vittatus*, Gray) have been found in Syria, no newt or salamander is known to occur in the Jordan system.

1. *Rana esculenta ridibunda*, Pallas.

Boulenger, *P.Z.S.* 1891, pp. 375, 376, 377.

This race of the edible frog is very common in the small fountains round the lake, and I also found it occasionally under stones at the edge of the lake itself. Mr. Boulenger tells me that he has examined specimens of very large size from this neighbourhood.

2. *Hyla arborea savignyi*, Aud.

Boulenger, *Cat Batr. Sal. Brit. Mus.*, p. 380.

I found a small specimen sitting dead but apparently uninjured on a stone at the edge of the lake, and at Nazareth, I saw many adults clinging to the walls of a large cistern lined with cement. In about half of them the dorsal surface was uniform leaf-green; in some it was pale clay-colour and in others of a rather darker shade spotted with dark grey. In all my specimens the anterior part of the black and white lateral line is distinct and there is a dark, pale-edged line running along the outer margin of each limb, as in the individual figured by Audouin; in none is there any trace of a line on the groin. The colour-characters on which the racial distinction of the form is based seem, therefore, to be constant.

3. *Bufo viridis*, Laur.

Boulenger, *op. cit.*, p. 297.

This toad is common at Tiberias but not often seen as it is strictly nocturnal in its habits.

4. *Clemmys caspica rivulata*, Valenc.

Boulenger, *Cat. Chel. Brit Mus.*, p. 104.

Small individuals are common in small pools and springs round the lake. As a rule they bask in the sun at the edge, but they are very easily disturbed and immediately dive and hide themselves in the mud at the bottom. Probably the older tortoises frequent the lake itself, but they are seldom seen. I watched a half-grown individual eating grape-skins that had been thrown into a pool at Ain-et-Tineh.

[1] Böttger, *Ber. Senck. Ges.* 1880, p. 208.

5. *Emys orbicularis* (Linn.)

Boulenger, *op. cit.*, p. 112.

The European pond-tortoise is said to reach a great size in the lake, but I did not obtain specimens.

(*b*) Terrestrial Reptiles.

The small collection of terrestrial reptiles brought back comprises the following species:—

Hemidactylus turcicus (Linn.)
Typhlops simoni (Böttgr.)
Eryx jaculus (Linn.)
Vipera libetina xanthina (Gray).

Except the *Typhlops*, these are all common species in Galilee. *T. simoni* is, however, apparently scarce. It was originally described from Haifa on the coast of Palestine by Böttger as *Onychocephalus simoni*,[1] its most remarkable feature being the compression and production forwards of the rostral scale to form a flattened triangular snout with trenchant edges. A specimen from Tiberias given me by Herr Grossman differs from Böttger's figures (and from his and Boulenger's descriptions) in having the eyes visible as minute black spots. It has also a rather longer tail than the specimen figured by Böttger. I cannot, however, detect any other difference.

Living specimens of *Testudo ibera*, Pallas, and *Chamaeleon vulgaris*, Gray, were also observed in the neighbourhood of Tiberias, as well as lizards of several species.

[1] *Ber. Senck. Ges.* 1878-1879, p. 58. See also the same journal for 1880-81, p. 135, pl. III, fig. 1, and Boulenger's *Cat. Snakes, Brit. Mus.* I. p. 51.

5. Some Noxious Diptera from Galilee.

By E. Brunetti.

The specimens noted here were taken in Galilee by Dr. N. Annandale in October, 1912. A separate report will be published on his collection of Culicidae.

Family MUSCIDAE.

Sub-family Muscinae.

Musca domestica, L.

Several specimens of both sexes, the species common in houses at both Nazareth and Tiberias. One specimen is labelled "sucking blood of horses," Kefr Kenna. (This specimen was taken full of blood. It had evidently been sucking blood at the wound made by some other fly.—N. A.)

Musca sp.? nov.

A ♂ and 5 ♀ ♀ represent a species that does not agree with such descriptions of Palaearctic species as are available for reference. It is rather smaller than *domestica*, and the thorax has a whitish grey appearance, with two narrow black stripes. The abdomen has an ill-defined dorsal black stripe, the hind edges of the segments are black, and in the single ♂ the general colour of the abdomen is yellowish instead of dark grey.

Common in houses, Nazareth and Tiberias.

Philaematomyia insignis, Aust.

Two ♀ ♀ of rather smaller size than usual, but undoubtedly of this common and widely distributed species labelled "sucking blood of horse," Kefr Kenna, 12-x-12 (This was by far the commonest blood-sucking fly on horses and cattle.—N. A.)

Stomoxys calcitrans, L.

Four ♀ ♀, including a dark variety devoid of distinct spots. In houses, Nazareth and Tiberias. (Also seen commonly on cattle.—N. A.)

Lyperosia minuta, Bezzi.

A single ♀, Tiberias, October. (The specimen was caught biting my hand at night. What I take to be this species is

very troublesome, especially in the early morning and at sunset, on the shores of the Lake of Tiberias, easily piercing ordinary flannel with its proboscis. The wound is not very painful and does not as a rule become inflamed.—N. A.)

Sub-family ANTHOMYINAE.

Limnophora tonitrui, Wied.

This is reported by Dr. Annandale as the commonest of the "house flies" after *Musca domestica*. The specimens seem to form a local race as the usual broad black transverse stripe is broken up into three large spots, in only one instance out of 2 ♂ ♂ and 5 ♀ ♀ being entire (a ♂).

There can be no reasonable doubt as to the identity of the species, which is quite common in houses, greenhouses, and similar habitats in India. Nazareth and Tiberias. (This fly is just as troublesome in its habits as *Musca domestica*, so far as settling on the face and hands is concerned.—N. A.)

N.B.—In addition to *L. tonitrui* there is a single specimen of a second species of Anthomyinae from Nazareth ("in house") which I am unable to identify.

Family HIPPOBOSCIDAE.

Hippobosca equina, L.

Four specimens from Tiberias, Nazareth and ("sucking blood of horses") Kefr Kenna. (Very common on horses and cattle.—N. A.)

[By far the most troublesome blood-sucking flies at Tiberias and Nazareth in October are the so-called sand-flies of the genus *Phlebotomus* (fam. Psychodidae). They occur in large numbers in every house, concealing themselves during the day in ceilings or dark corners to which they retire shortly after sunrise, and commencing their onslaught, which is continued until they retire, at sunset. Although I was unable to find the larvae, I obtained indirect evidence that they bred in half-dried algae just above the water-level on the sides of open cisterns. Miss S. L. M. Summers of the London School of Tropical Medicine, who has been kind enough to examine the adult specimens I collected, finds only two species (*Ph. papatasi* Scop. and *Ph. minutus* Rond.) among them, thus confirming the preliminary diagnosis made in the field. Col. Alcock tells me that he found the same two species, and them only, in a large collection from Aleppo. *Phlebotomus* apparently occurs at Tiberias practically throughout the year, but at Damascus, in which it is troublesome in summer, it had entirely disappeared before the end of October. I did not obtain *Ph. minutus* at Nazareth

and at Tiberias it was much less common than *Ph. papatasi*. Another irritating blood-sucker common at Tiberias in October, though much less so than *Ph. papatasi*, is a minute Chironomid of the subfamily Ceratopogoninae. Like *Phlebotomus* it is nocturnal in habits.

Tiberias is notorious even in Palestine for its fleas (*Pulex ? irritans*) but in the German hotel in which I stayed I saw and felt none.—*N. Annandale.*]

6. Tipulidae and Culicidae from the Lake of Tiberias and Damascus.

By F. W. Edwards, B.A., F.E.S.[1]

The collection of Tipulidae and Culicidae made by Dr. Annandale in October 1912, and forwarded to me for determination, though far from numerous either in individuals or species,—only three species of Tipulidae and seven of Culicidae being present,—has yet proved of very considerable interest. Three species at least are new to science, one of them (the *Uranotaenia*) being the first of its genus to be found within the Palaearctic region. The occurrence of *Conosia irrorata* makes a notable extension of the known range of this widely spread species.

TIPULIDAE.

1. Geranomyia annandalei, sp. n.

♂. Whole body dingy ochreous-brown; antennae, proboscis, tips of femora, wing-veins and knobs of halteres darker brown; eighth abdominal segment more ochreous. Proboscis nearly twice the length of the head and thorax together; palpi apparently one-jointed, inserted about $\frac{1}{3}$ of the way from the base of the proboscis. Thorax without distinct markings. Wings hyaline, without markings, except for the distinct stigma. Auxiliary vein reaching costa about midway between origin of praefurca and marginal cross-vein, subcostal cross-vein close to its tip. The usual additional cross-vein, found in most species of *Geranomyia*, present, connecting the auxiliary and subcostal veins just before the middle of the former. End of first longitudinal vein turned sharply up to the costa at the marginal cross-vein. Discal cell nearly three times as long as broad, the vein arising from it nearly equidistant at their base. Great cross-vein exactly at base of discal cell in the type, slightly before it in one paratype, slightly after in the other.

Length of body (without proboscis) 5·5 mm., of proboscis 3 mm., of wing 6 mm.

Three males, Plain of Gennesaret. "Taken on limestone cliff overhanging spring. Dancing in the air and then alighting on the cliff and swaying up and down." (N. A.)

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[1] Published by permission of the Trustees of the British Museum.

Type in the British Museum, paratype in the Indian Museum, Calcutta.

The unspotted wings distinguish this species from all others found in the Palaearctic region, and there is no described Oriental species which it resembles at all closely.

2. ? Antocha opalizans, O.S.

One male and one female taken on lower side of stone at edge of stream, R. Barada, Damascus.

These specimens may represent a species distinct from *A. opalizans*, as the wings are blackish-grey instead of milk-white; they are however immature, and so hardly fit to describe. In general colour and in the structure of the genitalia they closely resemble British specimens of *A. opalizans*.

3. Conosia irrorata (Wied.)

Aus. Zweif. Ins. I, p. 574 (1828).

One male, Wad-es-Semakh, L. Tiberias, "taken among weeds at the edge of small stream flowing into the lake" (N. A.).

CULICIDAE.

4. Anopheles palestinensis (Theo.)

Pyretophorus palestinensis, Theo., Mon. Cul., iii, p. 71 (1903).
Pyretophorus nursei, Theo., Mon. Cul., iv, p. 66 (1907).
Pyretophorus cardamitisi, Newst. and Cart., Ann. Trop. Med., iv, p. 379 (1910).

The above synonymy is given with full confidence, as I have carefully compared the types of *P. palestinensis* and *P. nursei* with one another and with a paratype of *P. cardamitisi*.

Dr. Annandale took two females at Tiberias. The species has been recorded from Palestine, Cyprus, Greece (Athens) and N.-W. India (Quetta). To this distribution may be added Persia (Kashan, 8-xi-1911, 1 ♀, *Dr. G. Cropper*).

5. Anopheles culicifacies, Giles.

Anopheles culicifarcies, Giles, Ent. Mo. Mag., p. 197 (1901).
Pyretophorus sergentii, Theo, Mon. Cul., iv, p. 68 (1907).
Tiberias: 4 ♂, 2 ♀.

These specimens differ from the typical Indian form in having about five distinct pale spots on the wing-fringe instead of only two, but otherwise they are perfectly normal. A

similar variation occurs in the closely allied Ethiopian species, *A. funestus.*

The collector has made the following note on this species. "Between October 2nd. and October 20th. I saw only one Anopheline mosquito at Tiberias. On October 16th the first rain of the season fell and on the morning of the 20th. I noticed numerous Anophelines of both sexes flying into my room through the window. The same species continued to be common in the house until I left Tiberias on October 27th. I found the larvae in small pools and springs among stones at the edge of the lake. Some of the springs were slightly saline." The single larva sent was too denuded to be of any use.

6. **Stegomyia fasciata**, F., Syst. Ant., p. 13 (1805).

Tiberias, 2 ♀. "Not uncommon (N. A.)."

7. **Culex modestus**, Fic., Boll. Soc. Ent. It., xxi, p. 93 (1890).

One female under stones, edge of L. Tiberias.

Determined by comparison with specimens sent from Hungary by Dr. Kertesz. There are very small pale apical lateral spots on the abdominal segments.

8. Culex pipiens, L., Syst. Nat. Ed., x, p. 602 (1758).

Nazareth, in house, 1 ♀ ; Tiberias, 2 ♀ ; Plain of Gennesaret, 1 ♂.

I have mounted the hypopygium of the male specimen, and find it to correspond exactly with typical *C. pipiens* from North Europe. It may be mentioned in passing that Dyar and Knab's figure of the hypopygium (Proc. Ent Soc. Washington, xi, 1909, pl. ii, fig. 4) does not show the parts in their normal positions, owing to the figure having been made from a specimen mounted flat on a slide. There is also an error in their description (*op. cit.*, p. 33) : "fourth" plate should read "first" (*i.e.* most dorsal) ; "upper" should be "second" and "second," "fourth."

One female from Tiberias has the usual pale bands of the abdomen reduced to inconspicuous white lateral spots, but it has the long first submarginal cell as in normal *C. pipiens.* I have seen specimens (of both sexes) similar to this from Gibraltar, and (females) from British East Africa.

9. **Culex laticinctus, sp. n.**

♂. *Head* dark, clothed with the usual "narrow curved" (whitish) and upright forked scales (black). Proboscis black-scaled, a little shorter than the abdomen. Palpi dark brown, exceeding the proboscis by less than the length of the last joint. Last two joints upcurved, very slightly hairy, small

patches of whitish scales towards their bases beneath, extending apically as a narrow ill-defined whitish line, not so conspicuous as that of *C. pipiens*. Hairs of antennae dark brown, golden towards the base.

Thorax light brown, scarcely at all tinged with red, mesonotum and scutellum clothed with narrow light ochreous scales not very closely placed. Median lobe of scutellum with about eight, lateral lobes with about four bristles. *Wings* : lateral vein scales very narrow, almost hair-like ; median short and broad, hardly discernible on the apical portion of the wing. Upper fork-cell about as long as its stem, its base slightly nearer the base of the wing than that of the lower. Halteres light brown, knob blackish. *Legs* black scaled ; femora (especially the hind pair) whitish beneath ; fairly distinct white spots at the apices of the femora and tibiae. Claws of fore and mid legs each with a single tooth.

Abdomen.—Each of segments 2-7 clothed with blackish brown scales on its apical half (or rather more), white scales on its basal half. The white bands are somewhat indented on each side of the middle, leaving a median projection, the last two being somewhat expanded laterally. Venter whitish. *Hypopygium* : Side pieces with a distinct tuft of hairs at the apex, plainly visible with a hand lens, but apt to become denuded in mounting ; lateral processes with 2 + 3 appendages, the most apical being slightly flattened at the tip and evidently representing the foliate plate of *C. pipiens*. Claspers rather broader than in *C. pipiens*. Harpes with a well-developed basal process. Harpagones divided into two plates, the lower one toothed.

♀. Resembles the male. Palpi black scaled, about one-fifth as long as the proboscis. Upper fork cell about twice as long as its stem, its base considerably nearer the base of the wing than that of the lower.

Remarks.—This species comes near *C. pipiens*, from which, however, it is abundantly distinct by the lighter thorax, shorter and less dense wing-scales, broader and whiter abdominal bands, shorter and less hairy male palpi, different male hypopygium, and shorter upper fork-cell in the female. The species which it most resembles in coloration is the Oriental *C. pallidothorax*, Theo. (= *C. albopleura*, Theo. = *Culiciomyia annuloabdominalis*, Theo.), but that species has very different fork-cells, the base of the lower being nearer to the base of the wing than that of the upper ; it also has the row of transparent outstanding scales on the male palpi characteristic of the genus (or group) *Culiciomyia*, which is certainly not present in *C. laticinctus*.

Occurrence.—Tiberias, 2♂ (including type, in the British Museum), 5♀. Also Gibraltar, July 1909, 5♂, 5♀ (*Major C. E. P. Fowler*).

10. Uranotaenia unguiculata, sp. n. ♂.

Head black scaled, a rim of bluish-white scales round the eyes and a patch of similar ones on the nape. Proboscis, palpi and antennae dark brown.

Thorax dark brown, almost black towards the margins of the mesonotum; a line of flat bluish-white scales extends from the wing-base forwards to the very front of the mesonotum, not, however, meeting its fellow; a similar line of scales, parallel with the first, extends across the pleurae and prothoracic lobes. *Wings* with dark brown scales, except for a short space at the base of the first longitudinal vein, where the scales are white. Lateral vein scales about three times as long as broad. Upper fork-cell rather narrower, but almost as long as lower. Halteres dark-brown, stem light brown. *Legs* dark-brown; under sides of femora and tibiae pale; a conspicuous patch of white scales at the apex of the hind tibiae above; middle femora with a pale line in front. Front legs not modified, except that the claws are much larger than usual and unequal; they are not, however, so unequal as those on the mid legs, which are normal.

Abdomen clothed with dark-brown scales above, except the eighth segment, which is white. Venter pale.

Remarks.—In two respects—the unusual front claws, and the prolongation of the upper of the two lines of bluish scales to the front of the mesonotum—this species differs from all known Oriental or Ethiopian species of the genus, and its recognition should therefore be easy. Apart from these peculiarities it has a general resemblance to the African *U. bilineata* and *U. mayeri*; the former however has banded hind tarsi and no pale line on the middle femora, and the latter has white at the base of the fifth (not first) vein, and has white markings on the abdomen.

Occurrence.—Tiberias, 1 ♂ (type: in the Indian Museum, Calcutta).

7. Aquatic Oligochaeta from the Lake of Tiberias.

By J. Stephenson, D.Sc., Major, I.M.S.,
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Dr. N. Annandale, of the Indian Museum, Calcutta, recently entrusted to me for examination a small collection of Oligochaete worms obtained by him from the shores of Lake Tiberias, Palestine, in October 1912. Besides the two species which are referred to at length below, the collection contained several other forms, which were unfortunately immature and therefore unidentifiable. These comprise one Enchytraeid, two Tubificids, and one Lumbricid (*Eisenia* or *Helodrilus*).

Criodrilus lacuum, Hoffm.

In wet mud under stones at edge of lake, near Tiberias, Palestine; October 18, 1912, October 24, 1912: in a similar situation near Mejdal (Magdala), on Lake Tiberias; October 25, 1912. A number of specimens, both mature and immature.

This worm has previously been recorded from Syria and Palestine by Rosa (*Boll. Mus. Torino*, vol. viii, no. 160, 1893), whose specimens were quite typical. The specimens in the present collection which I assign to this species show, however, certain peculiarities and a short description is therefore appended.

Length 6–7 ins.: breadth 4 mm. at broadest part, diminishing to 2 mm. posteriorly. Colour light grey: darker, with a greenish blue tinge, near the posterior end. The shape of the body is four-cornered in transverse section, except anteriorly. Segments 303.

Prostomium zygolobous. Anus dorsal. The posterior end may be broken off: in one specimen, which, though immature, probably belonged to this species, there were two constrictions near the posterior end, one of which, at one part of the circumference, was deep enough to open into the body-cavity. The constrictions are exaggerations of the intersegmental furrows, and would seem to represent an attempt at autotomy.

The setae are closely paired: *dd* is greater than *aa*.

The male apertures were, in six cases, on segment xv in three, and on xvi in three: they are transverse slits, with prominent anterior and posterior lips, constituting a large papilla; the centre of the slit is a little outside the line of setae *b*. The papilla reaches on its outer side nearly half way

between lines of setae *b* and *c*: where the pore is on xv, the papilla takes up the whole length of xv and xvi, and quite half of xiv.

(In what follows, the description will assume that the male aperture is on xv.)

The female apertures are situated in obliquely running cracks which bound the male papillae anteriorly and internally, these apertures are in line with setae *a*.

A 'genital area' may be described as follows: the fissures xiv–xv and xv–xvi are obliterated ventrally, and a wrinkled area extends over the ventral surface of segments xiv–xvi or xvii, or even partially on to xviii, between and behind the male papillae.

On a certain number of segments behind the male apertures the setae of series *a* are implanted in small circular papillae; this may be the case in xvii, xviii, xix, xx and xxi, but the distribution of the papillae may not be the same on the two sides.

The clitellum is very indistinct, and seems to vary; it seems to begin anteriorly about xxi–xxiv (once about xv), and to extend posteriorly to xxxvi or xxxvii.

Spermatophores were found adhering to the ventral and lateral aspects of segments xvii–xix in two instances; they were respectively four and six in number. In shape they were much compressed, and of approximately oval outline, fixed on the body wall so as to project vertically in the following way:—the long axis of the oval was parallel to the surface of the body, the short axis vertical to the surface, and the margin of the oval, where it was attached to the surface, was flattened and expanded. On the free border, which was compressed to a sharp ridge, was a slit-like opening; and within the clear glassy case was a whitish mass of spermatozoa. The long diameter of the spermatophore did not exceed 1 mm.

Internally, there was no differentiation of crop or gizzard. Hearts were present in vi–xi. The testes and funnels were large and conspicuous in x and xi; the vesiculae seminales, bulky and paired, were in ix, x, xi, xii; there was no trace of prostates in xv. Ovary, funnel, and ovisac were all prominent structures in the normal situations. There were no spermathecae.

What were probably large sporozoan parasites, similar to those described by Benham (*Q.J.M.S.*, n.s., vol. xxvii, 1887), were found in the body cavity in the segments near the male aperture. These were slightly curved rod-like structures, whitish in colour by reflected light, dark, granular and opaque by transmitted light; they were ·8 mm. long, ·04–·06 mm. broad, with a definite thin cuticle, and a nucleus about the middle of their length; their ends were surrounded by numerous adhering coelomic corpuscles.

The chief points of interest in the foregoing description are :—

(i) The clitellum. Hoffmeister (quoted in Vejdovsky, *System u. Morphologie der Oligochaeten*, Prag, 1884) and Örley (*Q.J.M.S.*, n.s., vol. xxvii) found no clitellum. Benham's estimate of its length (*Q.J.M.S.*, n.s., vol. xxvii) is on the other hand considerably greater than mine.

(ii) The distribution of the genital papillae differs from what is given by Örley, or by Michaelsen (*Oligochaeta*, in *Tierreich*).

(iii) With Vejdovsky and Benham, whose statements are adopted by Beddard (*A Monograph of the order Oligochaeta*, Oxford, 1895), I find no gizzard. Hoffmeister found a gizzard, and Michaelsen in defining the species mentions a rudimentary gizzard in xii–xiv.

(iv) Unlike Örley and Benham, I could find no trace of anything resembling a prostate; it is possible that the difference is more apparent than real, since Benham describes the gland as being epidermal in origin, continuous with, and a specialization of the surface epithelium. In my specimens, therefore, it may not have developed, owing perhaps to their being in an early stage of sexual maturity; that this was so is perhaps indicated by the fact that in one specimen the testes and funnels were noted as being large and conspicuous; Benham, who found the testes deeply situated and difficult of discovery, probably had later stages to deal with.

(v) The shape of the spermatophores is however not reconcilable with earlier observations, *e.g.* Hoffmeister (*ap.* Vejdovsky) and Örley, except by supposing that the greater part of the 6–8 mm. long tubular spermatophore described by the latter author has regularly been broken off, leaving only the basal portion.

Helodrilus (*Dendrobaena*) *lacustris*, sp. nov.

In wet mud under stones at edge of lake, near Mejdal (Magdala), Lake Tiberias, Palestine; October 25, 1912. With *Criodrilus lacuum*. Three specimens.

Length 1¼ ins.; breadth 1–1½ mm.; colour greyish, with blue tinge anteriorly. Segments 71–87.

Prostomium proepilobous (in one case only slightly so). Clitellum saddle-shaped, xxiv or xxv–xxx, = 6 or 7: with lateral ridges xxvi–xxviii or xxix at its ventral limit on each side.

Male pores xv (only made out in sections). Copulatory areas ventrally and ventrolaterally in ix, as two circular whitish patches on each side, slightly raised, setae *a* and *b* being in the centre of the respective patches; each patch takes up nearly the whole length of the segment from front to back, and those surrounding setae *a* and *b* on each side touch each other: but

there is a small interval in the middle line between the medially situated areas of the two sides. As seen in sections, the integument of the ventral surface of segment xv also contains more glandular cells than neighbouring regions, though no difference was noted externally.

The setae are not arranged in pairs, and the intervals appear to be a little variable. In one case these were estimated as $aa = ab = bc = cd = \frac{1}{2}\ dd$ approximately; in another aa slightly $> ab$, $ab = cd$, aa approx. $= bc$, $dd = 2\frac{1}{3}\ cd$. The length of an ordinary seta is ·3 mm.

Setae *a* and *b* in segment ix may be described as genital setae. They are implanted in the middle of the copulatory areas, and are long and straight; the setal sac and its muscles go much deeper into the body in the case of the genital than in the ordinary setae. A perfect seta was not obtained in any single section; the length however is probably approximately ·49 mm.

The specimens being so small, the internal anatomy could only be investigated by sections; the first 22 segments of one specimen was therefore sectioned longitudinally.

The oesophagus shows dilatations in xi–xii and in xiii–xiv, with longitudinal ridges projecting into the lumen. In xv is a larger thin-walled dilatation, with vascular walls, but no marked ridging. The gizzard extends from $\frac{1}{2}$ xvi–xix $= 3\frac{1}{2}$.

The last heart is in xi.

The genital funnels are large, folded, and free in x and xi. The seminal vesicles occupy segments ix, x, xi and xii; those in ix are much the smallest. those in x, xi and xii are all large, and of about the same size. The sacs in ix are paired, as also those in xii, those these latter meet dorsally over the intestine; in x and xi the sacs of each segment are completely fused above the gut.

The spermathecae are in segments x and xi, they are slightly ovoid, almost spherical sacs, paired, with narrow and somewhat sinuous ducts, opening dorsolaterally in furrows ix–x and x–xi; on one side the openings are a little way below the line of setae *d*, on the other side a little way above this line.

It will be seen that this species comes nearest, on the whole, to *H. (D.) ganglbaueri* var. *annectens* (Rosa); though it also has several points of resemblance to *H. (D.) byblicus* (Rosa), which was found several times in the collection examined by Rosa in 1893, one of the localities moreover being the very lake from the shores of which the present specimens were obtained. It differs markedly, however, in its smaller size, in the situation of the copulatory areas, and in the presence of the large seminal vesicle in segment x; indeed, in respect of the relative sizes of the vesicles in segments ix and x (small in ix, large in x) it appears to be peculiar in the subgenus.

8. An Account of the Sponges of the Lake of Tiberias, with Observations on Certain Genera of Spongillidae.

By N. Annandale, D.Sc., F.A.S.B.

(With Plates II to V.)

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Introductory Note.

The sponges of the Lake of Tiberias are of considerable interest. They fall naturally into two groups, one of which is represented by a race of the widely distributed *Ephydatia fluviatilis*, while the other consists of four species confined, so far as we know, to the lake and its immediate vicinity. The latter group includes representatives of two genera that seem to claim recognition as new, although I have been acquainted for some years with forms belonging to one of them.

The following is a list of the species obtained :—

1. *Ephydatia fluviatilis syriaca*, Topsent.
2. *Nudospongilla reversa, gen. et sp. nov.*
3. *N. mappa, sp. nov.*
4. *N. aster, sp. nov.*
5. *Cortispongilla barroisi* (Topsent), *gen. nov.*

The race *syriaca* of *Ephydatia fluviatilis* was described by Topsent from Lake Huleh (the Waters of Merom) on the Jordan north of the Lake of Tiberias and from the R. Barada near Damascus, while *Cortispongilla barroisi* was taken by Dr. Th. Barrois in the southern part of the lake itself, where I also found it. It was assigned by Barrois, and later by Weltner, to the genus *Potamolepis*, Marshall.

In this paper I propose (1) to describe the collection obtained by myself in the Lake of Tiberias in October, 1912; (2) to discuss the distribution and biology of the sponges of that lake; and (3) to consider the classification of the subfamily (Potamolepidinae) to which most of them belong, and to state my opinion as to the systematic position of certain other genera perhaps not really allied to the Potamolepidinae, but liable to be confused with genera included among them.

1. A Systematic Account of the Collection.

The conditions in which the specimens of the different species were obtained will be discussed in the second part of this paper. The following key may be useful to naturalists who visit the lake:—

Key to the Sponges of Lake Tiberias.

1. Sponge soft, by no means tough; gemmules present if conditions are suitable for their production. (The majority of the skeleton-spicules smooth; birotulate gemmule-spicules as a rule more than 0·03 mm. long)	*Ephydatia fluviatilis syriaca* (p. 59).
2. Sponge hard; no gemmules.	

A. Sponge massive, with deep round oscula .. .. *Cortispongilla barroisi* (p. 67).

B. Sponge encrusting the lower surface of stones; oscula never consisting of large rounded apertures.

a. Oscula consisting of deep open grooves of a simple character .. .. *Nudospongilla reversa* (p. 63).

b. Oscula approached by deep ramifying grooves covered by the dermal membrane.. *N. mappa* (p. 64).

c. Efferent apertures as a rule arranged in star-shaped groups on the surface without a definite osculum; skeleton much more massive, less regular and more friable than in other indigenous species.. .. *N. aster* (p. 65).

Fam. SPONGILLIDAE.

Subfamily *SPONGILLINAE*.

To this subfamily I assign all the freshwater sponges in which true microscleres are found.

Ephydatia fluviatilis syriaca, Topsent.

(Plate iii, fig. 1.)

Ephydatia fluviatilis, Topsent, Rev. biol. Nord France, 1893, pt. 1, p. 1.

E. fluviatilis var. *syriaca*, *id.*, Bull. Soc. Amis Sci. Nat., Rouen, 1909, p. 1.

Specimens of *Ephydatia fluviatilis* were not uncommon in October 1912, on the lower surface of stones standing in the water at the edge of the lake near Tiberias, Mejdal and Tabghah. They formed small crusts not more than two or three millimetres thick and three or four centimetres in diameter. In places were sunlight penetrated under the stones they had green corpuscles in their parenchyma-cells, and were as a rule of a bright leaf-green colour. In some places, however, notably in the neighbourhood of Mejdal, the green was masked, but not altogether obscured, by a blackish tinge due to minute dark particles, apparently inorganic, in the parenchyma-cells. In

places to which little or no light penetrated, the sponge was of a dirty white.

On two occasions I found (near Tiberias) specimens that had become completely or partly desiccated owing to the seasonal shrinkage of the lake. These contained numerous gemmules and were in a state of partial disintegration.

Topsent in describing his "variety" *syriaca* laid stress on two points, (*i*) the presence of spined as well as smooth macroscleres and (*ii*) the large size of the gemmule-spicules. In none of my specimens have I been able to find spined macroscleres. These spicules are all smooth, sharply and clearly pointed and relatively slender. They are very variable in size, those that were actually incorporated in the skeleton varying in length from 0·285 to 0·374 mm. and in greatest transverse diameter from 0·0123 to 0·0205 mm. Smaller spicules were observed lying free in the interstices of the skeleton, but resembled the larger ones in outline.

The gemmule-spicules were also variable in size, being from 0·0246 to 0·046 mm. long; but very few were as short as 0·03 mm. The spines on the shafts were as a rule more slender than those represented in Topsent's figure of the gemmule-spicules of the form *syriaca*. They thus provide a link between the gemmule-spicules of typical European specimens of the species and of the form from Lake Huleh and the Barada. As, however, they are on an average distinctly larger than those of the former, I consign my specimens to the race *syriaca*.

I can detect no bubble-cells (cystocytes) in the parenchyma of well-preserved specimens.

The sponges from the Lake of Tiberias seem to be intermediate between *syriaca* and the *forma typica*, but it is difficult to say how far the difference is directly due to seasonal changes or to environment. Topsent's specimens were taken at the end of April and the beginning of May; mine in October. He found empty gemmules, round which the spined macroscleres were to some extent congregated, while the gemmules in my specimens were full and apparently healthy.

Subfamily *POTAMOLEPIDINAE, nov.*

This subfamily is distinguished from the Spongillinae (that is to say from the remainder of the Spongillidae) by the total absence of true microscleres. In some species there are two kinds of macroscleres, but although one of them is usually more slender than the other, there is no marked difference in length. Gemmules are as a rule completely absent; if they are present they lack not only microscleres but also pneumatic coverings and foramina.

The sponges of this subfamily are, as a rule, at least moderately hard; they have not, however, the stony hardness of *Uruguaya*, and some are much less hard than others.

To the subfamily Potamolepidinae I assign the following genera :—

Nudospongilla (gen. nov.), *Pachydictyum*, Weltner, *Cortispongilla* (gen. nov.) and *Potamolepis*, Marshall. Whether or no Grimm's *Metschnikowia*[1] should be associated with these genera is doubtful.

The two new genera are described below, being represented by species from the Lake of Tiberias, and in the third section of this paper *Pachydictyum* and *Potamolepis* are discussed and compared with certain other genera The following key may prove of use in distinguishing all these genera. The names of those that are not Potamolepidinae are printed in parentheses. Gemmule-characters, in the case of genera that produce gemmules, are omitted ; but the names of those genera in which gemmules are known to occur are marked with an asterisk.

Key to certain genera of Freshwater Sponges.

I. Minute birotulate microscleres present in the parenchyma. (Sponge hard ; skeletal fibres as a rule somewhat ill-defined : exceedingly stout vertical fibres sometimes present) .. .. [*Corvospongilla.**]

II. No microscleres.

1. No trace of a subdermal cavity or of efferent grooves under the dermal membrane in the neighbourhood of the oscula. (External membrane delicate; a skeletal cortex produced immediately below the derma by the splaying out of well-developed vertical fibres ensheathed in strong chitinous substance) .. .. [*Veluspa.**]

2. A subdermal cavity usually present ; efferent subdermal grooves as a rule well developed.

A. A thick chitinized external membrane present. (No definite skeletal cortex; vertical and transverse fibres similar ; sponge of stony hardness) .. [*Uruguaya.**]

B. External membrane delicate.

[1] The author's original description is not available, but the genus is redescribed by Dybowski in the paper cited in the bibliography opposite his name.

	b. A skeletal cortex produced a short distance below the external membrane by a thickening of transverse fibres. (Vertical fibres in central part of sponge better developed than transverse ones; a branched central cavity; sponge hard)	*Cortispongilla.*
	b[1]. No skeletal cortex. (Vertical fibres better developed than transverse ones).	
B.	Large elliptical central cavity. (Sponge hard) ..	*Pachydictyum.*
B.	Central cavity small and ill-defined.	
	b. Sponge not more than moderately hard, friable	*Nudospongilla.**
	b[1]. Sponge very hard, not friable	*Potamolepis.*

NUDOSPONGILLA, *gen. nov.*

Sponge as a rule moderately hard; never very soft; friable. No well-defined central cavity; oscula small or moderate, often surrounded by radiating (efferent) furrows in the parenchyma; afferent subdermal cavity well developed. A chitinous basal membrane usually present. Cystocytes apparently absent.

Skeleton.—Somewhat variable, never very stout; both vertical and transverse fibres distinguishable, but the latter often not very distinct; the vertical fibres always distinctly, but often not markedly, stouter and more coherent than the transverse ones; a skeletal network often present on the surface of the sponge, forming the floor of the subdermal cavity, but no regular cortex.

Spicules.—The skeleton spicules are moderately slender amphioxi or amphistrongyli, as a rule smooth but sometimes spiniferous. I have not found spherical siliceous bodies in any species.

Gemmules, if present, devoid of foramina, pneumatic coat and spicules, adherent at the base of the sponge, ovoid in outline and somewhat flattened.

Type-species. Spongilla coggini, Annandale.

Distribution.—The type-species is from Western China, whence a second species (*N. yunnanensis*) also comes. Three

Galilean forms are described below; but I am not fully satisfied that they are actually congeneric. Three species from Central Africa (*S. tanganyikae* and *S. moorei*, Evans, and *S.* (?) *cunningtoni*, Kirkpatrick) and at least one from Celebes (*S.* (?) *vasta*, Weltner) should also be assigned provisionally to the genus.

Nudospongilla reversa, *sp. nov.*

(Plate ii, fig. 2; plate iii, figs. 2, 2*a*; plate v, fig. 3.)

Sponge hard but friable, forming crusts or lamellae on the lower surface of stones and sometimes projecting therefrom to include small objects such as fragments of stick. The colour of the type, which was growing in the dark, is pale grey. The upper surface is minutely hispid; the lower surface bears a delicate chitinous membrane. On the upper surface there are broad, deep, patent oscular grooves which are not covered by the dermal membrane except at their narrower extremity, *i.e.* at the extremity furthest from the larger exhalent apertures. The main efferent channels open directly into the sides of these grooves, running a slightly oblique, but essentially horizontal course through the substance of the sponge. Some of the channels measure as much as 3 mm. in diameter; the greatest depth of the grooves is 4 mm. and the greatest width 5 mm. When the surface of the sponge is examined with a lens the structure appears to be coarse and irregular (pl. v, fig. 3).

Skeleton.—In the basal part of the sponge the skeletal reticulation is obscure and almost amorphous, although traces of both vertical and transverse fibres can be detected. Above the main horizontal channels the network is of a more definite nature, but the vertical fibres are not much more distinct than the transverse ones; at first sight both appear to be thick, but a closer examination shows that each fibre is composite, consisting of at least two strands not quite parallel to one another. The spines on the surface consist of much more slender fibres, as a rule not more than three spicules thick, projecting upwards through the dermal membrane. At the base of these fine fibres there is a distinct horizontal network of spicules, but it is not thickened or compressed to form a cortex. The meshes of the skeleton are small throughout. There is not very much chitinous matter present.

Spicules.—The skeleton-spicules are short, smooth, moderately stout amphioxi, feebly curved and by no means sharply pointed. They are from 0·263 to 0·34 mm. long, but the majority are approximately of the greater length; the greatest transverse diameter varies from 0·024 to 0·029 mm. A few smaller and more sharply pointed amphioxi occur in all spicule-preparations, but these lie loose in the interstices of the skeleton, and are probably immature or abortive spicules.

No gemmules were found.

Type.—Z.E.V. No. $\frac{5\ 7\ 2\ 2}{7}$ Ind. Mus.

Habitat.—Lake of Tiberias, Palestine. The unique specimen was taken (15-x-1912) close to the edge in less than one metre of water and within a few hundred yards of the exit of the Jordan on the east side, but not in the actual channel of the river. It grew on the lower surface of a stone, projecting out under another stone, and including a small twig in its substance. The free portion was about 5 mm. thick and some 30 mm. long and broad, but the shape was irregular.

The most remarkable feature of *N. reversa* is the manner in which the main efferent channels, instead of opening into a regular central cavity or an osculum situated on the surface, run sideways into a deep groove. The great breadth of these channels and their regular horizontal course are also characteristic. The spicules are intermediate in form between those of *Cortispongilla barroisi* and those of *Nudospongilla aster*. They are considerably stouter than those of *N. mappa*, specimens of which were taken together with the type.

Nudospongilla mappa, *sp. nov.*

(Plate ii, fig. 4; plate iii, figs. 3, 3*a*; plate v, figs. 2, 2*a*. 2*b*.)

Sponge hard, forming thin films on the lower surface of stones, bright green in sunlight, white or yellowish in the dark. The upper surface is very minutely hispid; the lower surface bears a delicate chitinous membrane. On the upper surface there are long, shallow, profusely branching grooves resembling rivers on a map and covered by the dermal membrane. They open ultimately into small and inconspicuous oscula, of which very few are present (if there is more than one) in each sponge. The pores are larger than is usually the case in the Spongillidae, measuring about 0·052 mm. in diameter. They are grouped together immediately over the mouths of the main efferent channels, which run vertically downwards into the sponge. The dermal membrane covering the branching grooves is imperforate, and the grooves themselves represent the ultimate ramifications of the efferent channels, which open as cylindrical tubes into their floors.

Skeleton.—Except near the surface of the sponge, the skeletal reticulation is not well defined, but slender vertical fibres can be traced upwards practically from the base of the sponge, from which they run in a straight vertical line for some distance, and then branch dichotomously with considerable regularity. On the surface they do not project so far or form such well-defined spines as in *N. reversa*. On the surface there is a very distinct transverse reticulation, which, viewed from

above, looks very regular, the meshes being nearly circular in outline[1] (plate v, fig. 2).

Spicules.—The spicules are more slender and more sharply pointed than those of the other species of *Nudospongilla* found in the lake.

No gemmules were found.

Type.—Z.E.V. No. $\frac{5\,2\,3\,0}{7}$ Ind. Mus.

Habitat.—Lake of Tiberias and R. Jordan at and near its exit therefrom. *N. mappa* was found at every spot on the shore of the lake examined that possessed loose stones of a suitable size It was not found where only very small pebbles were present, because it adhered as a rule only to the lower surface of stones of six inches or more in diameter or to smaller stones covered by fairly large ones. The largest specimens were taken actually in the Jordan near its exit. None were taken in more than one metre of water.

N. mappa resembles some species of *Stratospongilla* in structure, but I could find no trace of gemmules in any of the many examples examined both preserved and in a living condition. Desiccated sponges of the species were often found above the dry-season water-level.

From *E. fluviatilis syriaca* the new species, which resembles it in external appearance, can be at once distinguished by its very much greater hardness and the closer reticulation of its skeleton. It cannot be confused with any other sponge as yet known from Palestine. In external appearance, and also possibly to some extent in structure, it exhibits some resemblance to the Caspian genus *Metschnikowia*, Grimm. One of the essential characters of that genus is stated by Dybowski (following Grimm) to be spininess of the spicules, but this is not a feature of any importance in the Spongillidae, in which species with spiny spicules are often closely allied to species with smooth ones.

Nudospongilla aster, *sp. nov.*

(Plate ii, fig. 3; plate iii. figs. 4, 4*a*).

Sponge hard but very friable, forming a crust of no great area on stones and shells. The main efferent channels open obliquely, on the surface, as a rule in little star-shaped groups, so that there is no true osculum. Sometimes their extreme distal parts are only covered by the dermal membrane. The external surface of the sponge is smooth. The colour is either

[1] The parenchyma is bulky in spite of the compactness of the skeleton, and the vertical efferent channels have stout and clearly marked walls. Their tubular character is reflected to some extent in the skeleton of the sponge, but gives it a greater appearance of regularity than it actually possesses.

leaf-green or dull grey. the former shade being due to the presence of intracellular corpuscles. There is no definite chitinous basal membrane.

Skeleton.—The reticulation of the skeleton fibres is somewhat loose in the basal part of the sponge, but traces of thick transverse and horizontal fibres can be detected. In the upper part it becomes more compact, a noteworthy feature being the fact that single transverse fibres often run obliquely for a considerable distance through the sponge; but the reticulation is nowhere of a regular character, although extremely massive at all points. On the surface the transverse network is close and the fibres stout, but vertical fibres do not project upwards through the dermal membrane in the form of spines.

Spicules.—The spicules closely resemble those of *N. reversa* but are longer and relatively more slender.

No gemmules were found.

Type.—Z.E.V. No. $^{5\ 2\ 3\ 2}/_{7}$ Ind. Mus.

Habitat.—Lake of Tiberias, Palestine. Three specimens were found, one (on a flint nodule) immediately off the exit of the Jordan in 4 5 metres of water, and two (on a piece of sandstone and the shell of a living *Unio terminalis* respectively) in the actual channel of the river, although within the lake, in about 6 metres. On one of my large specimens of *Cortispongilla barroisi* there is, in a crescentic depression on the surface round one of the main oscula, a small green patch. Spicules from this patch agree with those of *N. aster* rather than with those of *C. barroisi*, and I have little doubt that the patch represents a young sponge of the former species. The specimen was taken close to the spot at which two of *N. aster* were obtained.

The best developed and largest of my specimens of this species, and also the only one (with the exception of the "green patch" just alluded to) that exhibited the colour of chlorophyl, was the one taken off the exit of the Jordan. As the river flows out of the lake obliquely, the specimen apparently did not come from its actual channel, but from what may be regarded as the main area of the lake.

Although harder than *N. reversa*, *N. aster* is more friable than any other species of Potamolepidinae from the lake. Its smooth surface distinguishes it, if it be examined with a hand-lens, from either *N. reversa* or *N. mappa*. It is much harder than *Ephydatia fluviatilis* and differs from *Cortispongilla barroisi*, apart from other characters, in having no central cavity or well-defined oscula.

CORTISPONGILLA, *gen. nov.*

Sponge hard, but not of stony hardness, more or less friable, with a well-developed branching central cavity from which a large osculum opens directly. In large sponges several sys-

tems of the kind are found. The subdermal (afferent) cavity is poorly represented or absent, but efferent channels covered only by the dermal membrane can often be detected in the neighbourhood of the oscula. Cystocytes are apparently absent.

Skeleton.—The skeleton consists of well-developed vertical fibres crossed at frequent intervals by less well-developed transverse ones. Near the external surface the latter fibres are greatly thickened so as to form a strong casement or cortex beyond which thickened vertical fibres project upwards, supporting the dermal membrane, which is not strongly chitinized, but apparently somewhat collenchymatous.

Spicules.—In the only known species the skeleton-spicules are stout and rather blunt amphioxi. More slender and sharper amphioxi are occasionally found, but appear to be merely immature spicules. Spherical siliceous bodies have not been found.

Gemmules.—No gemmules have been found.

Type-species (unique).—*Potamolepis barroisi*, Topsent.

Distribution.—Only known from the Lake of Tiberias on the Jordan system in Palestine.

The only other genus that approaches *Cortispongilla* in structure is *Pachydictyum*, Weltner, from which it is distinguished chiefly by the formation of a regular skeletal cortex. The hardness of the sponge is due in a very large measure to this structure (pl. iv, figs. 3, 4). In the genus *Veluspa*, Miclucho-Maclay, which apparently occurs both in Lake Baikal (fresh water) and in Arctic Seas, a somewhat similar cortex is formed, but in an entirely different manner and not quite in the same position (pl. iv, fig. 5).

Cortispongilla barroisi (Topsent).

(Plate ii, figs. 1, 1*a*; plate iii, fig. 5; plate iv, fig. 4.)

Potamolepis barroisi, Topsent, Rev. biol. Nord France, v, (1892).
Weltner, Wiegm. Archiv. f. Naturgesch., lxvii (1), p. 195 (1901).

My specimens of this species, which were taken in October, appear to be in a different phase of growth from those taken by Barrois in May, and also perhaps are somewhat better preserved. It seems probable, to judge from Topsent's figures, that, between these two months, the whole outer part of the sponge is habitually worn away. Thanks to the generosity of Dr. Weltner of the Berlin Museum, I have been able to examine fragments of one of Topsent's co-types It is evident that this specimen was heavily parasitized by an alga and therefore most probably more fragile than my own and somewhat degenerate in structure, as well as being deficient in its external parts. There can, however, be no question as to the specific identity.

I obtained five specimens, which varied in size from 35 × 23 × 21 mm. to 85 × 75 × 60 mm., the last measurement being that of the greatest depth of the actual sponge in each case. Two approached the largest specimen in bulk, and one was only a little bigger than the smallest. The colour in life was dull grey with a tinge of glaucous green. This tinge has completely disappeared from dried specimens, but traces of it still remain in fragments preserved in alcohol. An examination of both living and preserved material convinces me that it was due not to intracellular, but to extracellular parasitic algae such as Topsent found in much greater profusion in his examples.

Apart from colour, the point in which my specimens seem to differ most strikingly in external characters from Topsent's is in the fact that they have fewer oscula. Two of the small specimens and one of the larger ones have only one osculum each, while the two remaining large ones have two and three main oscula respectively. In those with only one it is of large size, precisely resembling the main oscula of the others. In the examples in which more than one main osculum is present, several smaller subsidiary oscula also occur. The main oscula open directly into a deep cylindrical cavity extending downwards either straight or obliquely into the substance of the sponge for several centimetres. Into this cavity the main efferent channels open obliquely upwards, and as these channels in older sponges are of greater relative width, the whole cavity has a branched appearance (pl. ii, fig. *a*). In younger sponges they have a smaller diameter and are not so conspicuous. In the case of what I have called the subsidiary oscula there is no deep cavity, but efferent channels running horizontally and more or less superficially open directly into them. In their case, and sometimes in that of the main oscula also, there are radiating channels entering the osculum on the surface and only covered by the dermal membrane.

The dermal membrane is not easily separated from the sponge. Although not greatly thickened, it has a somewhat collenchymatous character, and thus differs in appearance from that of most Spongillidae, in which the limits of the epithelial cells are, as a rule, perfectly distinct under suitable conditions and the membrane is very delicate.

The dermal pores are minute, but I have not been able to detect pore-cells on the external surface or in any other part of the sponge, although I have made a careful examination of well-stained histological material.

The most characteristic feature of the skeleton did not attract the attention of the author of the species, probably because his material was imperfect. I mean the skeletal cortex formed by the apparent thickening of the transverse spicule-fibres a short distance below the dermal membrane. The distal part of the vertical fibres, which are interrupted in their

upward course by the cortex cutting across them, is also greatly thickened, containing a large number of spicules lying more or less parallel. In both cases, however, the apparent thickening is due not to a thickening of individual fibres, but to a massing together of separate fibres. In the cortex the individual fibres can be seen crossing one another at right angles, and in a vertical section the spicules of some of them are always cut through the middle. The thickened ends of the vertical fibres are also composite and have extra transverse fibres linking them together.

Of the internal soft part of the sponge there is, in the present state of our knowledge, very little that can be said with profit. Topsent has figured certain cellular elements. The ciliated chambers are ovoid in form. They are absent from the cortical region, and extremely abundant near the base of the sponge. Bubble-cells are completely absent. Extracellular unicellular algae are abundant in the superficial parts, but although the sponge-cells are well preserved in some of my specimens, the vegetable cells are not and I can say little about their structure.

I have been unable to find any trace of gemmules. Sperm mother-cells are abundant in one specimen and another contains young embryos, which resemble those of *Spongilla* and *Ephydatia*.

I only found *C. barroisi* on small pebbles in the actual channel of the Jordan as it runs through the south end of the Lake of Tiberias between the village of Semakh and the exit of the river from the lake. The water in this channel is from 4 to 8 metres deep. Apparently Barrois found his specimens in exactly the same spot; the differences between them and my own are to be attributed, directly or indirectly, to seasonal changes.

Note on Dermal Pore-cells in the Spongillidae.

Owing to its thinness and to the comparatively large size of its pores, *N. mappa* affords unusually good material for the study of the dermal pore-cells. Some of my specimens are very well preserved, having been fixed in picro-formol-acetic solution, and I have been able to mount microscopic preparations of the dermal membrane and in some cases even of the whole sponge, that exhibit the structure of that membrane with great clearness.[1]

[1] One method of preparation, originally suggested by an accident, has proved, although crude in technique, efficacious. A transverse section is made along the surface of the sponge with a knife and mounted (after being stained with borax carmine, dehydrated and cleared in cedar-wood oil) in thick Canada balsam on a slide. A thin cover-glass is placed over it and the blunt end of a pencil pressed down

The pore-cells in *N. mappa* are highly specialized (plate v, figs. 2*a*, 2*b*), as they appear to be in all Spongillidae in which they have been detected. In this species they are grouped together on circular areas immediately above the orifices of the main inhalent channels, the number of orifices in each area varying from about 12 to about 20. The orifices vary in diameter from 0·045 to 0·0675 mm. They are naturally circular but in mounted preparations are liable to distortion. Each pore-cell consists of a slender ring of cytoplasm which stains a little darker than that of the ordinary flattened epithelial cells and has an obscurely reticulate structure. The nucleus is elliptical in form, measuring about 0·006 × 0·003 mm., the greater axis lying parallel to the circumference of the aperture, on which the cell encroaches in the form of a slight bulge opposite the nucleus. So far as I have been able to discover there is no break in the continuity of the ring formed by the pore-cell.

In specimens of the sponge that have been dried after careful preservation in a liquid medium (plate v, fig. 2) the apertures in the dermal membrane are considerably enlarged and those that are enclosed in the pore-cells are readily visible with a hand-lens, causing the circular perforate areas that correspond with the orifices of the main inhalent channels to stand out in sharp contrast to the imperforate roof of the branching exhalent grooves. In part of the type of *N. reversa* (plate v, fig. 3) which I have dried there is a comparatively large area of perforate membrane, but it is not confined to the orifices of the inhalent channels or defined in any exact manner, merely forming an irregular patch on the surface. This specimen is not so well preserved as some of the paratypes of *N. mappa*, and I have not been able to detect actual pore-cells either in *N. reversa*, *N. aster* or *Cortispongilla barroisi*. The mechanical difficulties involved in a careful examination of the dermal membrane in the two last species are, however, considerable.

In *Ephydatia fluviatilis syriaca* pore-cells can be readily detected in the dermal membrane of well-preserved material, but they are not grouped together in so regular a manner as in *N. mappa* and, as the membrane for some reason does not stain so readily, are more difficult to detect. They resemble those of *N. mappa* in structure but are smaller, the aperture of the largest pores having a diameter of about 0·02 mm.

My specimens of *N. mappa* and *E. fluviatilis syriaca* were scraped from stones with a knife before being preserved, but notwithstanding this violent treatment, their pore-cells appear

upon the cover and rotated until the glass is broken and the section completely crushed. The fragments of glass and all but the smallest fragments of sponge are then removed with a pair of fine forceps and a new cover-glass is put on.

to be fully expanded. I have pointed out elsewhere,[1] it is doubtful whether the pore-cells of Spongillidae can contract in such a way as to obliterate the aperture they contain.

A re-examination of old preparations and a careful comparison between them and those recently made leads me to the conclusion that highly developed pore-cells actually exist in the dermal membrane of most Spongillidae but can only be detected in unusually well-preserved specimens. In serial sections it is difficult, if not impossible, to see them. Their arrangement differs in different species; in some they are grouped as in *N. mappa*; in others they are practically confined to the edge of the sponge; in others again they occupy more or less clearly defined areas on the surface, and in some they are probably scattered. In those species such as *Spongilla carteri* in which the inhalent apertures appear to be comparatively large in ordinary well-preserved material, they are probably protected in the living sponge by a delicate dermal network in which the meshes are outlined by pore-cells.

Whatever the exact origin of the pore-cells of the Spongillidae may be, and this is a problem that calls for a careful embryological investigation that would be foreign to my own inquiries, they appear to be highly differentiated as mature cells from the ordinary pinacocytes of the dermal membrane. In *Spongilla crassissima*, apart from their ring-like form, they closely resemble the cells that line the orifices of the ciliated chambers, but I was wrong in stating[2] that in this sponge the inhalent apertures in the dermal membrane are occasionally bounded not by a single cell, as is usually the case, but by two crescent-shaped cells of similar structure joined together at the tips to enclose the aperture between them. My mistake was due to a slight folding of the membrane in some of my preparations whereby two cells were brought into unnatural relations with one another.

2. Biology and Distribution of the Sponges of the Lake of Tiberias.

From a biological point of view the sponges of the Lake of Tiberias fall into two groups in accordance with the precise environment in which they are found. One group (which consists of *Ephydatia fluviatilis syriaca*, *Nudospongilla mappa* and *N. reversa*) is practically confined to shallow water close to the shore, while the other, including *Cortispongilla barroisi* and *N. ester*, flourishes in the deeper but less still waters of the channel of the Jordan as it traverses the lake. The former group may be conveniently known as the littoral sponges; the latter as the sponges of the Jordan channel.

[1] Faun. Brit. Ind.—Freshwater Sponges, etc., p. 32 (1911).
[2] Rec. Ind. Mus., I, p. 271 (1907).

The littoral sponges (of which *N. mappa* was very, and *E. fluviatilis syriaca* fairly, common in October, 1912) were found without exception either on the lower surface of stones of large or moderate size or, much more rarely, on the upper surface of small stones covered and protected by large ones. Only one specimen of *N. reversa* was preserved, but I did not distinguish this species from *N. mappa* in the field and have reason to think that many specimens I failed to collect actually belonged to it. While *N. mappa* and the *Ephydatia* invariably form adherent crusts, this species sometimes extends outwards from its support in thin lamellae. There was no difference in the manner of growth of the former two species, except that while single sponges of *N. mappa* often covered an area of moderate extent, those of the *Ephydatia* were always quite small. In the case of both species individual sponges remained distinct from one another even when they were so closely crowded together as to have the appearance of a mosaic. *N. mappa* is certainly commoner on fragments of basalt than on pieces of limestone, but was found on several occasions on the latter.

The two sponges of the Jordan channel as a rule adhere to small stones, and the massive form of *C. barroisi* renders it impossible that this species should grow on the lower side thereof. There was no evidence that the specimens of *N. aster* dredged in the channel or its vicinity had been on the lower side either; indeed, this was practically impossible in the case of the two that adhered to stones. My third recognizable specimen was on the siphonal end of one shell of a living *Unio*. It was the smallest of the three. Probably it was on that shell which habitually lay uppermost.

Apart from the *Ephydatia*, all the sponges of the Lake of Tiberias are unusually hard. The utility of this character is not so clear in the case of sponges that inhabit a lake as it is in some others. Probably all the species of *Potamolepis* and *Uruguaya*, as well as a majority of those of *Corvospongilla*, live in running water that is apt at certain periods to flow with great swiftness. These genera contain the hardest known freshwater sponges, and it is evident that hardness is convenient to them in that it prevents them from being torn in pieces and washed away, as would be the fate of most Spongillidae in similar circumstances. Although, however, there is little movement in the water round the edge of the Lake of Tiberias in calm weather, the lake has long been notorious for its storms, in the course of which sponges growing on stones at the edge must be exposed to considerable violence. In the case of *Ephydatia* the evil effects of violence of the kind are perhaps obviated, so far as the survival of the species is concerned, by the production of gemmules; but the hardness of *N. mappa* may be of very great advantage in stormy weather, when the waves beat on the stones to which it is attached. The largest specimens of

this species I obtained were, moreover, actually in the Jordan just after it had left the lake, and when in flood the stream must flow with great strength at this point.

The case of the sponges of the Jordan channel in the lake is not quite the same. They cannot be affected by storms to the same extent, for they live in from 4 to 8 metres of water; but that there is a considerable current, perhaps increased in wet weather, in that part of the lake in which they live, is proved by the fact that the bottom is there devoid of fine silt and covered with coarse grit and small stones. Only a very small part of the channel has yet been explored, but, so far as is at present known, *Cortispongilla barroisi* is confined to an area of not more than two square miles. This was found to be the case both by Barrois, whose investigations were made in May, and by myself in October. *N. aster*, on the other hand, is apparently not confined to the channel, although only found as yet either in it or in its vicinity: but, so far as I can say, does not occur in less than 4 metres of water. With the structural peculiarities of *C. barroisi* and their biological significance I shall deal presently, but it is noteworthy that *N. aster* is by far the most friable of the Potamolepidinae known from the lake.

A most important question both from a taxonomic and a biological point of view is that of the production or non-production of gemmules by the Potamolepidinae. The evidence on this point is unfortunately of a negative nature in most cases; but there is some positive evidence in the case of the Galilean species that gemmules are at any rate not habitually produced, and we know that in a few species (*Nudospongilla coggini*, *N. moorei* and *N. tanganyikae*) of the sub-family these bodies are sometimes found. I have found them also in a specimen of *Veluspa bacillifera* from Lake Baikal. In all these sponges they are devoid not only of microscleres but also of pneumatic coat and foramina. In *Spongilla* (*Stratospongilla*) *clementis* from the Philippines, the structure of which closely resembles that of *Nudospongilla* generally, and especially that of the type-species *N. coggini*, the gemmules are few in number and bear remarkably attenuated microscleres; while imperfect development of the pneumatic coat is a common feature of the species of *Stratospongilla*, although in one species (*N. bombayensis*) it is less degenerate in a variety or local race (*pneumatica*) than it is in the typical form. The disappearance of the gemmule is therefore not a character of so fundamental a nature as might appear at first sight to be the case: we find some species in which it has lost the elaboration characteristic of the Spongillidae as a family, and others in which it has apparently been suppressed altogether.

The evidence that the latter statement is true lies, so far as the sponges of the Lake of Tiberias are concerned, in the

following facts. *C. barroisi* was found by Barrois in May and by myself in October, and at neither season did a careful examination reveal any trace of gemmules, although the specimens killed in May were evidently in a senescent condition. Both May and October are critical periods in the climatology of Palestine : in May the dry season is established and the summer heat commences, whereas in October the first rains fall and the temperature sinks rapidly. It is now well known that whereas gemmules are produced by freshwater sponges at the approach of winter in Europe, they are more frequently produced in the Asiatic tropics at that of summer. In both cases their production appears to be initiated by a change in the temperature of the water in which they live. In Calcutta *Spongilla carteri*, our commonest species, usually produces gemmules in greatest abundance at the approach of the hot weather, in which it perishes, but if a sponge is growing at the edge of a pond in which the water sinks during the cold season, it produces its gemmules and then perishes, in winter. The reason for this apparently is that the water to which the sponge is confined, having become very shallow through desiccation, is actually rendered hotter by the sun than would be the case in much warmer weather if the water were deeper. The water-level of the Lake of Tiberias is lower in October than at almost any other time of year (see fig. 2, pl. 1, in this volume) and large numbers of sponges may be found on stones that are partly or completely dry. I made a very careful study of those that had become desiccated or partially desiccated in this way, and I found that whereas *Ephydatia* had produced gemmules, *N. mappa* had not done so. Changes in environment, as I have pointed out elsewhere,[1] do not necessarily have the same effect on different species of freshwater sponges, but I think we may take it as at least probable that *N. mappa*, if it were capable of producing gemmules, would do so when undergoing a process of slow and steady desiccation.

Evidence, moreover, is accumulating that the adoption of a limnic as distinct from a fluviatile mode of life is liable to produce degeneration of the gemmules in freshwater sponges. Miss Stephens[2] has recently shown that in the case of *Heteromeyenia ryderi* in Ireland individual sponges which live in lakes, produce or at any rate mature their gemmules less readily than others of the same species from neighbouring streams, and Potts[3] described two limnic forms of *Spongilla lacustris* (vars. *abortiva* and *montana*) in which the gemmules were more or less degenerate.

[1] Faun. Brit. Ind., Freshwater Sponges, etc., p. 5 (1911). Journ. As. Soc. Bengal, 1912, p. 50.

[2] Proc. Roy. Irish Acad., xxxi, pt. 60, p. 64 (1912).

[3] Proc. Acad. Nat. Sci. Philadelphia, 1887, pp. 191, 192.

It is easy to see that a sponge living in a warm climate in a lake in which a considerable depth of water is maintained throughout the year, has not the same need for the production of gemmules as one from a small pond or stream that is liable to be dried up or frozen solid. Marshall has advanced the view that an important function of the gemmule-spicules is that of weighting the gemmules, in order that they may not float away too readily. If so, it is not surprising that in species in which the gemmules are adherent their microscleres should disappear, and as the main function of the pneumatic coat is that of enabling the gemmules to float, this coat might also be expected, on *à priori* grounds, to be eliminated in the same circumstances, just as the eyes of cavernicolous animals are eliminated in the dark.

Embryos were found in all species of Galilean sponges examined in October, proving that sexual reproduction as well as vegetative growth is vigorous at that time of year.

As *Cortispongilla barroisi* is the most highly specialized species of the sponge-fauna described in this paper, it will be as well to discuss the biological significance of its peculiarities. Apart from the hardness of its skeleton, a feature shared with other sponges of the Lake of Tiberias, the genus is remarkable for the production of a skeletal cortex and for the possession of a well-defined and almost symmetrical central cavity. (It would be misleading to call the latter a gastral cavity, for there is no evidence that it is homologous with the gastral cavity of more primitive sponges.) A cavity similar in most respects, but less well defined and less nearly symmetrical, is found in many specimens of *Spongilla carteri*,[1] but occurs only in sponges that live in still water. It is almost obliterated in specimens attached to bushes the supra-aquatic parts of which are agitated by the wind, its place being taken in this case by superficial branching channels, and also in races from south-western India and eastern Europe as to the biology of which we are ignorant. The only freshwater sponge in which a cavity is found comparable to that of *C. barroisi* in regularity is *Pachydictyum globosum* from Celebes,[2] in which the relative size and the actual regularity of the cavity are greater than in the Galilean species. *P. globosum* was found attached to the shells of living Gastropods in a lake in Celebes. The production of a cavity of the kind, which is correlated with the presence of a large circular osculum, is apparently a provision to assist in the elimination of mud or sand drawn into the system through the pores, the exhalent channels being strong enough to keep the osculum clean. I have noticed that if *Spongilla proliferens* is kept alive in an aquarium, the number of oscula (and consequently the

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1 Journ. As. Soc. Bengal, 1906, pl. i, fig. 1.
2 Weltner, Wiegm. Arch. f. Naturgesch., lxvii (1), pl. vi, fig. 3 (1901).

total oscular area) is invariably increased owing to the appearance of oscula on areas from which they were previously absent. This is apparently due to the fact that the sponge experiences difficulty, in unnatural surroundings, in getting rid of waste or extraneous matter. Barrois's heavily parasitized specimens of *C. barroisi* possessed more oscula than mine, which were less heavily parasitized and in a more healthy state in other respects. *C. barroisi*, although it avoids the more muddy parts of the Lake of Tiberias, is subjected habitually or periodically to danger from the numerous pieces of grit that enter its substance. As Topsent points out, and as is also clear in my specimens, débris of the kind is always abundant in the sponge, which protects itself by secreting a chitinous coating round the extraneous particles. We know very little about the biology of *Pachydictyum*, but the fact that it is sometimes associated with molluscs of the genus *Melania* would suggest that it is liable to be carried into very muddy spots. The fact that *Nudospongilla aster*, which inhabits the same environment as *C. barroisi*, is a peculiarly compact sponge without any trace of a central cavity is noteworthy: but it is not unusual for two species that live together to adopt diametrically opposite means to attain the same end, and if the particularly well-developed exhalent system implied in the production of a central cavity opening by a large osculum, is advantageous in getting rid of silt that has entered the sponge, a compact structure may be equally efficient in preventing the silt from entering at all.

The other main peculiarity of *Cortispongilla*, *viz.* the skeletal cortex, renders the sponge harder and less friable than it would otherwise be, but I have no suggestion to offer as to the precise reason why its development should be particularly advantageous to this genus. An interesting point is its analogy to the skeletal cortex of the freshwater species of the genus *Veluspa* in Lake Baikal. Possibly the cortex performs a similar function in the two genera. In *Veluspa*, as has already been noted, it is produced by a splaying out of the extremities of the vertical skeleton-fibres, whereas in *Cortispongilla* it is due to an agglomeration of fibres a short distance within the sponge. In the species of *Veluspa* chosen for illustration (pl. iv, fig. 5) the difference is, however, more clearly seen than it is in some other species of the genus, because the cortex is much less well developed and the vertical fibres are very distinct one from another even at their distal extremities.

The interest of the sponge-fauna of the Lake of Tiberias is biological rather than geographical, except in so far as it affords evidence of long-continued isolation, for the genera and species suggest no valid proof of any close relationship to the sponge-fauna of any other district or region. Moreover, we know little as yet of the lower invertebrates of fresh water of other parts of Western Asia or of North Africa. The sponges of the lake

differ considerably from those of European, tropical African or tropical Asiatic fresh waters. The one endemic genus (*Cortispongilla*) appears to be related to *Pachydictyum*, which is endemic in a lake in Celebes; but the relationship may not be very close. The genus *Nudospongilla*, if it is to be accepted as a natural group, is probably of wide distribution in the hotter parts of the Old World, but none of the species found in the Lake of Tiberias exhibit a clear connection with any species from elsewhere. It is possible, moreover, that *N. mappa* has some actual affinity with Grimm's genus *Metschnikowia*, which is only known from the Caspian Sea. The fact that the race of *Ephydatia fluviatilis* found in the lake is distinct from the typical European form of the species is in itself evidence of isolation, for *E. fluviatilis* has a very wide geographical range but has produced comparatively few local races. In this case such relationship as exists is with Syria only, for the race is not known to occur any further afield.

3. Classification of the Potamolepidinae and of some obscure genera of Spongillinae.

In dealing with the sponges of the Lake of Tiberias I have found it necessary to examine a large amount of material from different parts of the world. As the collection of freshwater sponges in the Indian Museum is probably the largest and most nearly complete in existence, all known genera being represented, I take this opportunity to discuss certain genera of obscure status. The genera are *Corrospongilla*, Annandale; *Uruguaya*, Carter; *Potamolepis*, Marshall; and *Pachydictyum*, Weltner. A consideration of their essential features will render it possible to indicate more precisely the relationship of *Cortispongilla* and *Nudospongilla*, and of the Potamolepidinae generally, to the Spongillinae.

Another genus that calls for remark in this connection is *Veluspa*, Miklucho-Maclay, from which I find it difficult to separate Dybowski's *Lubomirskia*. This genus I have banished provisionally from the Spongillidae, but it is not impossible that it will ultimately resume its position in the family circle. In a short paper[1] now in the press I have pointed out, in agreement with Korotneff[2] and Svartzevski,[3] that some of the species assigned to *Lubomirskia* by Dybowski[4] actually conform to that author's diagnosis of *Veluspa*, and have further advanced the view that the sponges of Lake Baikal probably present a complete transition between the two

[1] Ann. Mus. Zool. Ac. Sci. St. Pétersbourg, 1913 (*ined.*).
[2] Biol. Centralbl., xxi, p. 305 (1901).
[3] Zapiski Kiev. Obshch., xvii (2) (1901).
[4] Mem. Ac. Sci. St. Petersburg (7) xxvii, No. 6, p. 11 (1880).

supposed genera as defined by Dybowski; Miclucho-Maclay's[1] original description of *Veluspa* being of too general a nature to carry much weight. The courtesy of the authorities of the Zoological Museum of the Imperial Academy of Sciences of St. Petersburg has recently enabled me to examine a large collection from Lake Baikal in which four of the species assigned provisionally to *Veluspa* are well represented. These are *V. baicalensis* (Pallas), *V. bacillifera* (Dybowski), *V. abietina*, Svartzevski, and *V. intermedia* (Dybowski). They may be taken as a characteristic set of species so far as the sponge-fauna of Lake Baikal is concerned, but as I have not seen any of the marine forms assigned by Dybowski and other authors to *Veluspa*, I do not feel competent to express a very dogmatic opinion as to whether the two series are congeneric. All that I can say is that the four species (and I have little doubt also all other Baikal sponges except species of *Spongilla* and *Ephydatia*) agree sufficiently well with Dybowski's definition of *Veluspa* to be attributed to that genus, at any rate until further investigations have been made into the structure of the allied sponges of Arctic seas. As I have pointed out in dealing with the biology of *Cortispongilla* (*antea*, p. 76), the most obvious generic character of *Veluspa* (*Lubomirskia*) is the fact that the vertical fibres are splayed or flattened out to form a skeletal cortex on the surface of the sponge. The characters I consider of more than generic importance are (*i*) the apparent absence in the Baikal species of both a subdermal cavity and efferent subdermal grooves, (*ii*) the regular unbroken course of the vertical fibres, and (*iii*) the great toughness and elasticity of the chitinous sheath in which the spicule-fibres are encased.

Turning from the peculiar Baikal sponges to species that must be assigned definitely to the Spongillidae, I propose first to consider two genera (*Corvospongilla* and *Uruguaya*) that undoubtedly belong to the Spongillinae.

Fam. SPONGILLIDAE.

Subfam. *SPONGILLINAE.*

Genus CORVOSPONGILLA, Annandale.

(Plate iv, fig. 1.)

Faun. Brit. Ind. Freshwater Sponges, etc., pp. 122, 243 (1911);
Rec. Ind. Mus., vii, p. 387 (1912).

This genus has recently been described and discussed in detail. My only reason for introducing it here is to point out its very close resemblance in certain characters to *Potamolepis*, the type-genus of the Potamolepidinae. The skeleton-spicules, as

[1] *Ibid.* (7) xv, No. 3, p. 2 (1872).

in *Potamolepis*, are often stout, smooth amphistrongyles mixed with a much smaller number of relatively slender amphioxi, but the skeleton is remarkable for the fact that the spicule fibres are usually, despite its compactness, of a somewhat ill-defined nature, thus differing from those of *Potamolepis*. Apart from the possession of highly specialized gemmules, which are often of two kinds, any specimen of *Corvospongilla* can as a rule be readily distinguished from any specimen of *Potamolepis* by the fact that minute birotulate spicules can be found lying free in the parenchyma of the former. In some, if not in all, species, however, the number of these spicules present is variable; sometimes it is so small that they can only be discovered with difficulty.

Genus **URUGUAYA**, Carter.

(Plate v, fig. 4.)

Carter, Ann. Mag. Nat. Hist. (5), vii, p. 100 (1881); Hinde, *ibid.*, (6), ii, p. 1 (1888); Weltner, Wiegm. Arch. f. Naturgesch., lxi (1), p. 130 (1895).

Sponge of stony hardness, forming crusts or bush-like growths with more or less cylindrical vertical branches. The external surface is covered by a thick, chitinous membrane in which (at any rate in dried specimens) numerous minute air-spaces occur, having the appearance of granules. The subdermal efferent grooves take the form of ramifying channels of small calibre, but it is impossible to say, after examining dried specimens only, whether there is a true afferent subdermal cavity.

Skeleton forming a dense net-work of vertical and transverse fibres firmly welded together. The individual fibres are very stout and contain a large amount of chitinous material, but the sheath it forms is never so regular as in *Veluspa*. The vertical fibres are not distinguished in any way from the horizontal fibres and do not project upwards on the surface of the sponge.

Spicules.—In all known species the skeleton spicules are stout amphistrongyles, but free amphioxous macroscleres also occur in some. There are no free microscleres. The microsclere of the gemmule consists of a short, comparatively stout shaft bearing an undivided rotule at either end. The rotules are equal and have the form of concave saucers, the concavity being in the same direction in the two belonging to each spicule.

Gemmules.—The gemmules, which are small, adhere to the base of the sponge, and are poorly provided with or altogether lacking in pneumatic coating. Apparently they have no foramina.

Type-species.—*Spongilla corallioides*, Bowerbank.

Distribution.—Tropical and subtropical South America on the Atlantic side of the Andes.

The following species belong to the genus:—*Uruguaya corallioides* (Bowerbank), *U. repens*, Hinde, *U. macandrewi*, Hinde, *U. pygmaea*, Hinde, and *U. amazonica*, Weltner. *U. amazonica* is represented in the collection of the Indian Museum by several fragments of the type-material.

In describing the genus *Potamolepis* Marshall confessed that the only consideration which prevented him from uniting it with *Uruguaya* was a geographical one, and, so far as the original descriptions of the two genera go, there is no reason for considering them to be distinct, except that one group is found in Africa, the other in South America. This reason, as all students of the Spongillidae would probably now agree, is a very poor one.

Hinde, however, since Carter and Marshall published their diagnoses of the two genera, has shown that gemmules are normally present in *Uruguaya*, and a characteristic feature of the genus that has apparently escaped the notice of former writers is fortunately well illustrated, so far as its external appearance is concerned, in his figures. I refer to the thickened, chitinized and pneumatic external membrane (plate v, fig. 4). In many if not all Spongillidae there is a certain amount of chitinous substance present in the external membrane. It forms a well-defined ring round the osculum in the Indian race (*reticulata*) of *Spongilla lacustris* and in *S. crassissima*; as Evans [1] has shown, it spreads out in continuation of the binding substance of the vertical skeleton-fibres on the surface of *S. moorei*; but I know of no freshwater sponge except the species of *Uruguaya* in which it has the minutely and apparently granular (really pneumatic) structure characteristic of that genus.

Subfam. *POTAMOLEPIDINAE.*

Genus POTAMOLEPIS, Marshall.

(Plate iv, fig. 2.)

Marshall, Ann. Mag. Nat. Hist. (5), xii, p. 405 (1883).

This genus, apart from the apparent absence of gemmules, differs from *Uruguaya* in the normal structure of its dermal membrane, and in the fact that the vertical skeleton fibres are better developed than the transverse ones and project upwards on the surface of the sponge to support the dermal membrane. The sponge, moreover, has not quite the same stony consistency, although it is always very hard. In at least

[1] Quart. Journ. Micr. Sci., xli (new series), p. 476 (1899).

one species (*P. chartaria*) the amphioxous macroscleres are highly differentiated and form a definite layer on the surface, but in all known forms the skeleton-spicules are stout amphystrongyles closely resembling those of *Uruguaya* and of some species of *Corvospongilla*.

Type-species.—*Potamolepis leubnitziæ*, Marshall.

Distribution.—Tropical Africa.

The species that certainly belong to *Potamolepis* are *P. chartaria*, Marshall, *P. leubnitziæ*, Marshall, and *P. pechueli*, Marshall. *P. weltneri*, Moore,[1] is a doubtful species, possibly composite and possibly in part at least to be assigned to *Corvospongilla*. The only specimen in the Indian Museum appears to represent *P. pechueli*.[2]

Genus PACHYDICTYUM, Weltner.

(Plate iv, fig. 3.)

Wiegm. Arch. f. Naturgesch., lxvii (1), p. 188, pl. vi, figs. 1-4 and 6-26 (1901).

Dr. Weltner in describing *Pachydictyum globosum*, the unique species of this genus, gives no generic diagnosis apart from that of the species. His excellent figures are, however, sufficiently clear to show the generic characters, and he has been kind enough to send me a schizotype. Moreover, he compares his species in detail with Topsent's *Potamolepis barroisi*, the sponge which it resembles most closely. For this sponge I have proposed the new genus *Cortispongilla*.

From *Cortispongilla*, which is fully described above (p. 66), *Pachydictyum* differs in the total absence of a skeletal cortex. As Weltner has pointed out, the branching of the skeletal network is not precisely similar in the two sponges, but I doubt whether this is really a matter of much importance. Both sponges are remarkable in possessing an unusually well-defined central cavity, but whereas in *Pachydictyum* the cavity is elliptical and communicates with the surface by a cylindrical passage at one side, in *Cortispongilla* it is tubular as a whole, giving out lateral branches in larger specimens but always opening on the surface directly at its upper end. From *Potamolepis* both sponges are distinguished by the development of this central cavity and also by the amphioxous form of their skeleton-spicules and their more friable skeleton.

Pachydictyum is only known from Lake Posso in Celebes, where the unique species (*P. globosum*) was found by Herren Paul and Fritz Sarasin attached to shells in shallow water.

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[1] Moore, "The Tanganyika Problem," p. 323 (1903).

[2] It is from the Upper Luarula River, the type-locality being Isangila, a place on the Congo about 150 miles up stream from the sea.

The foregoing discussion of the genera other than *Cortispongilla* and *Nudospongilla* that belong to the new subfamily Potamolepidinae, and of the Spongilline genera liable to be confused therewith, has cleared the way for a consideration of the precise taxonomic position of the sponges of the Lake of Tiberias.

The new genus (*Nudospongilla*) is proposed, and placed in the Potamolepidinae largely as a matter of convenience, in order to facilitate the classification of those freshwater sponges in which there is some evidence either that gemmules are never produced or, being produced, are devoid of microscleres and other characteristic features. In other words, there is evidence that the species here associated do not possess microscleres in any circumstance and are on the way to lose, if they have not already lost, the bodies whose elaboration is peculiarly characteristic of the Spongillidae as a family, *viz.* the gemmules. The evidence on this point is discussed on p. 74.

There are instances even among perfectly typical species of Spongillidae in which, owing apparently to degeneration, microscleres are either altogether absent or very poorly represented, *e.g.* certain forms of *Spongilla lacustris*, in some respects the most primitive species of the family; but in these instances the general structure of the sponge closely resembles that of its more robust relations. In most, if not all species of *Ephydatia*, moreover, the only microscleres normally produced are those associated with the gemmule, and in the Lake of Tiberias itself specimens of this genus were found that were absolutely free of microscleres and could only be assigned to it because their skeletal structure was identical with that of sponges that did contain gemmules bearing the characteristic microscleres. The general structure of the type-species of *Nudospongilla* closely resembles that of certain sponges belonging to the subgenus *Stratospongilla* of the genus *Spongilla* and, further, so closely resembles in particular that of a species (*S. clementis* from the Philippines) in which the gemmule-spicules exhibit signs of degeneracy, that it is hard to escape the conviction that some if not all the species of *Nudospongilla* are merely degenerate forms of *Stratospongilla*. The species from Central Africa and Celebes, to which I have alluded on p. 63, should be associated provisionally with my own from China and Palestine.

These facts, taken together, afford a strong argument against the recognition of the genus *Nudospongilla*, and also against its inclusion in the same subfamily as *Potamolepis*. Nevertheless, so long as it is understood that the genus as here constituted is a provisional one from which certain species may ultimately have to be discarded, even if the genus itself should stand the test of research and criticism, I think its recognition convenient as an aid to future investigations. Even if *Spongilla lacustris* or any other typical species of any recognized gemmule-bearing genus could be proved by actual

experiment to lose its power of producing gemmules in peculiar circumstances, the fact would not provide a valid argument against the retention of a separate genus of which the chief generic character was the invariable absence or degeneracy of the gemmules. In any case, it seems to me more satisfactory to call species of a certain facies in which no microscleres have been found, by some such name as *Nudospongilla*, rather than to refer to them vaguely as "*Spongilla* (?) sp."; for it has been recognized that the specific characters of many such species are well marked, and specific names have been conferred on them, although their genus has been queried.

Cortispongilla stands on a somewhat different footing, for it possesses positive structural characters that separate it from all other freshwater sponges. It is perhaps actually related to *Pachydictyum*, its resemblance to *Veluspa* (*Lubomirskia*) being apparently superficial and due to convergence rather than genetic relationship.

The recognition of the subfamily Potamolepidinae as here defined depends to some extent on the fact that no gemmules have been found in any species that can be definitely assigned to the genus *Potamolepis*. This genus is known from but a few specimens, although it is apparently far from uncommon in certain parts of the Congo basin. None of these few specimens possess, so far as we know from the original descriptions of them, either gemmules or any kind of true microsclere. The circumstances in which they, or at any rate most of them, were found are circumstances in which gemmules might have been expected to have been produced: but it must not be forgotten that many encrusting Spongillidae (notably some species of *Corvospongilla*) produce gemmules that adhere firmly to the base of the sponge and are apt to be left behind when a specimen is removed for preservation. There is, therefore, a considerable chance of their being overlooked when it is examined in a museum. We know that some *Nudospongillae* do produce gemmules, but that these gemmules, which are not always present, are less highly organized than those of the Spongillinae and entirely lack microscleres. Possibly those of *Potamolepis* are of a similar nature, if they are ever produced: those of *Veluspa* are not very dissimilar. If so, no difficulty arises. Should, however, gemmules be found in an undoubted *Potamolepis* with specialized gemmule-spicules that can be called microscleres, the genus would have to be transferred to the Spongillinae, and the subfamily to which the other genera without microscleres would then belong would be known as the Pachydictyinae. I am inclined to think that this course may ultimately prove necessary. Perhaps, however, the genera *Pachydictyum* and *Cortispongilla* will be found, when the minute anatomy of the Moxaxonida is better known, to be widely different in organization from all other freshwater genera and

recognized as component parts of a family distinct from the Spongillidae. For the present it seems convenient to make the presence or absence of microscleres a test for the separation of the freshwater sponges other than those confined to Lake Baikal into two subfamilies, the Spongillinae with microscleres and the Potamolepidinae without them. Most of the sponges of the Lake of Tiberias belong to the latter subfamily.

SUMMARY.

1. It is convenient to divide the Spongillidae into two subfamilies, the Spongillinae, in which microscleres are present, and the Potamolepidinae, in which they are apparently not produced.

2. Of the five species found in the Lake of Tiberias only one, a race of the widely distributed *Ephydatia fluviatilis*. belongs to the Spongillinae. This race (*syriaca*, Topsent) has already been recorded from another lake on the Jordan system and from the R. Barada near Damascus.

3. The four species of Potamolepidinae fall into two genera, both of which are described as new, *viz. Cortispongilla* and *Nudospongilla*.

4. The former genus is monotypic and the one species (*C. barroisi*, Topsent) is only known from the lake. It is perhaps related to *Pachydictyum globosum*, Weltner, from Celebes.

5. *Nudospongilla* is represented by three species from the lake, all of which are new; but it is also known to occur in China and probably in Central Africa and Celebes. Possibly *Nudospongilla* is related to *Metschnikowia*, Grimm, a genus peculiar to the Caspian Sea.

6. There is no reason to think that the sponge-fauna of the Lake of Tiberias is closely related to that of any other lake, but its affinities lie rather with that of eastern tropical Asia, and possibly with that of the Caspian Sea, than with any in Europe and Africa.

7. There is evidence that the sponges of the lake, with the exception of the *Ephydatia*, have lost or are losing the power of reproducing their species by means of gemmules, = a feature characteristic of the Potamolepidinae as a subfamily.

8. In other respects *Cortispongilla* is a highly specialized genus, remarkable for the production of a skeletal cortex due to the thickening or concentration of the transverse spicule-fibres a short distance beneath the dermal membrane, and for the development of a well-defined and almost symmetrical central cavity that opens directly through the osculum.

9. The resemblances that exist between this genus and certain sponges of the genus *Veluspa* (*Lubomirskia*) from Lake Baikal are probably due to convergence and not to genetic relationship.

10. Each of the species of *Nudospongilla* that occurs in the lake exhibits very marked structural peculiarities probably of an adaptive nature, but the genus itself is distinguished from the Spongillinae, more especially from *Stratospongilla* (a subgenus of the type genus *Spongilla*) by negative rather than positive characters.

11. All the sponges of the Lake of Tiberias are in a state of strong vegetative and reproductive vigour in October (*i.e.*, towards the end of the hot dry season), unless they are actually undergoing desiccation at the margin of the lake.

12. It appears to be possible to separate the sponge-fauna of the lake into two localized groups, one of which (consisting of *Ephydatia fluviatilis syriaca*, *Nudospongilla mappa* and *N. reversa*) is practically confined to shallow water close to the shore, while the other (including *Cortispongilla barroisi* and *Nudospongilla aster*) flourishes in the deeper and probably less still waters of the main channel of the R. Jordan as it traverses the lake.

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EXPLANATION OF PLATES.

Plate II.

Photographs of Sponges from the Lake of Tiberias.
(nat. size.)

Fig. 1.—Large specimen of *Cortispongilla barroisi* (Topsent) attached to a small stone. The dark depressed mark close to the single large osculum shown in the photograph probably represents a young sponge of *Nudospongilla aster*.
Fig. 1*a*.—Vertical section through the osculum of a rather smaller sponge possessing only one oscular system: to show the branched central cavity.
Fig. 2.—Part of the type-specimen of *Nudospongilla reversa*, showing the deep oscular grooves.
Fig. 3.—Type-specimen of *Nudospongilla aster* (on a flint nodule).
Fig. 4.—Type-specimen of *Nudospongilla mappa*.

Plate III.

Skeletons and Spicules of Sponges from the Lake of Tiberias.

Fig. 1.—*Ephydatia fluviatilis syriaca*, Topsent. A. Skeleton-spicules, × 40. B. Gemmule-spicules, × 120.
Fig. 2.—Skeleton-spicules of *Nudospongilla reversa* (A. × 120: B. × 40). Fig. 2*a*.—Vertical section of part of external region of skeleton, × 20.

Fig. 3.—Skeleton-spicules of *Nudospongilla mappa* (A. × 120: B. × 40). Fig. 3*a*.—Vertical section of part of skeleton from the external surface to the base of the sponge, × 20.
Fig. 4.—Skeleton-spicules of *Nudospongilla aster* (A. × 120: B. × 40). Fig 4*a*.—Vertical section of part of external region of skeleton, × 20.
Fig. 5.—Skeleton-spicules of *Cortispongilla barroisi* (Topsent), × 40.

N.B.—In all the figures of vertical sections of the skeleton the upper profile represents the external surface.

Plate IV.

Vertical Sections of the External Region of the Skeleton in Five Genera of Freshwater Sponges: all × 16.

Fig. 1.—*Corvospongilla burmanica bombayensis*, Annand. (from Idar State, Bombay Presidency).
Fig. 2.—*Potamolepis pechueli*, Marsh. (from the Liapulu R., Central Africa).
Fig. 3.—*Pachydictyum globosum*, Weltner (schizotype).
Fig. 4.—*Cortispongilla barroisi*, (Topsent) (topotype).
Fig. 5.—*Veluspa abietina*, Schki. (from Lake Baikal).

Plate V.

Dermal Pores, etc., in the Spongillidae.

Fig. 1.—*Spongilla proliferens*, Annand.: a dermal pore-cell, × 280 (fixed in absolute alcohol and stained with haematoxylin).
Fig. 2.—*Nudospongilla mappa*: photograph of a part of the external surface of the type-specimen (dried), × 7; to show the circular pore-areas. Fig. 2*a*.—A single pore-area with the supporting skeleton as seen from the external surface (fixed with picroformol-acetic solution and stained with borax carmine), × 50. Fig. 2*b*.—Part of the same preparation, × 200.
Fig. 3.—*Nudospongilla reversa*: photograph of a part of the external surface of the type-specimen (dried), × 7; to show the scattered pore-areas.
Fig. 4.—*Uruguaya amazonica*, Weltner: vertical section through an osculum, × 40; to show the thickened pneumatic external membrane and the skeleton-spicules lying parallel to it.

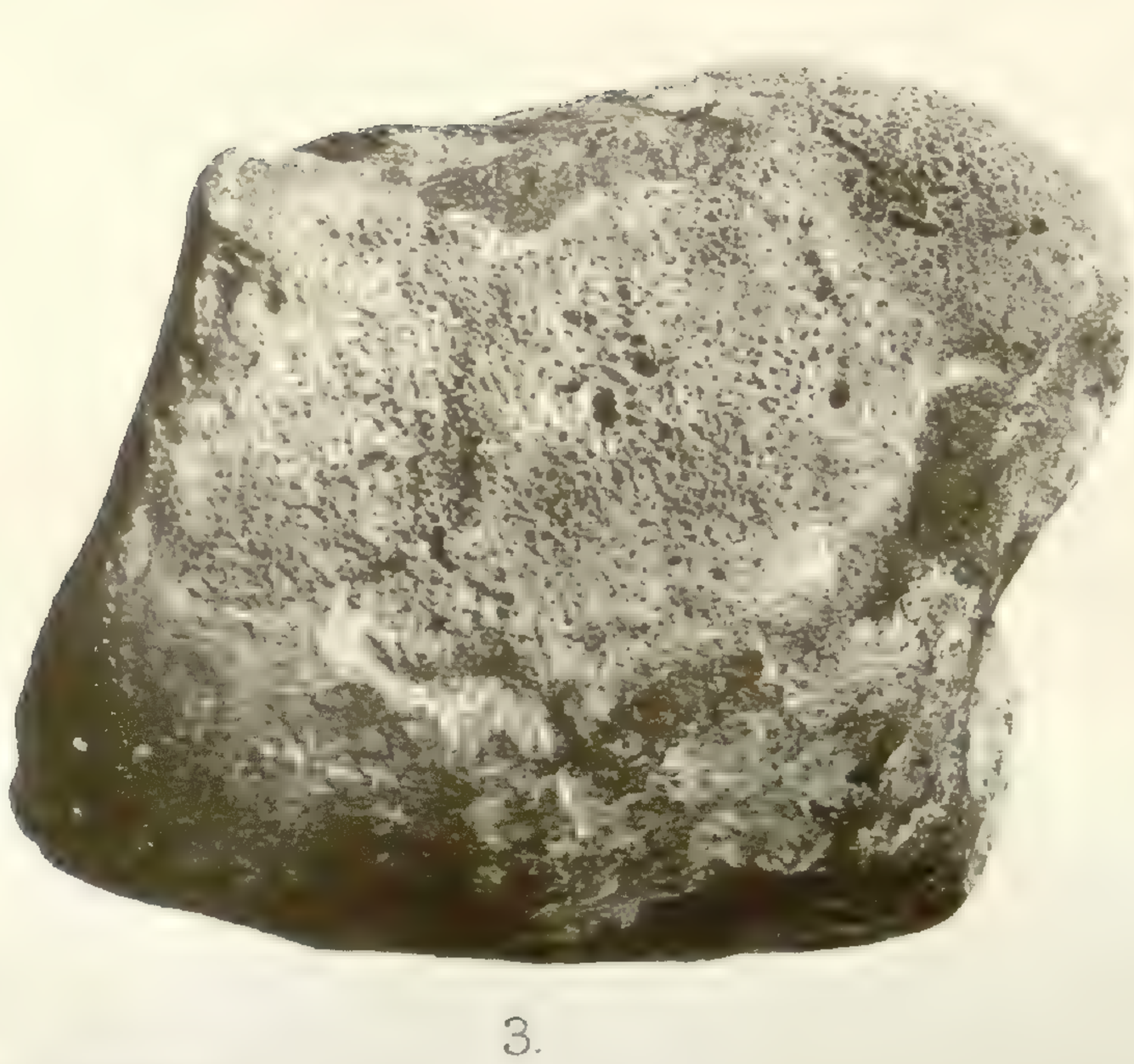
Note.—In figure 2*b*. the nuclei of the pore-cells are not clearly differentiated from chance accumulations of granules as was the case in the original drawing.

PHOTOGRAPHS OF THE LAKE OF TIBERIAS.

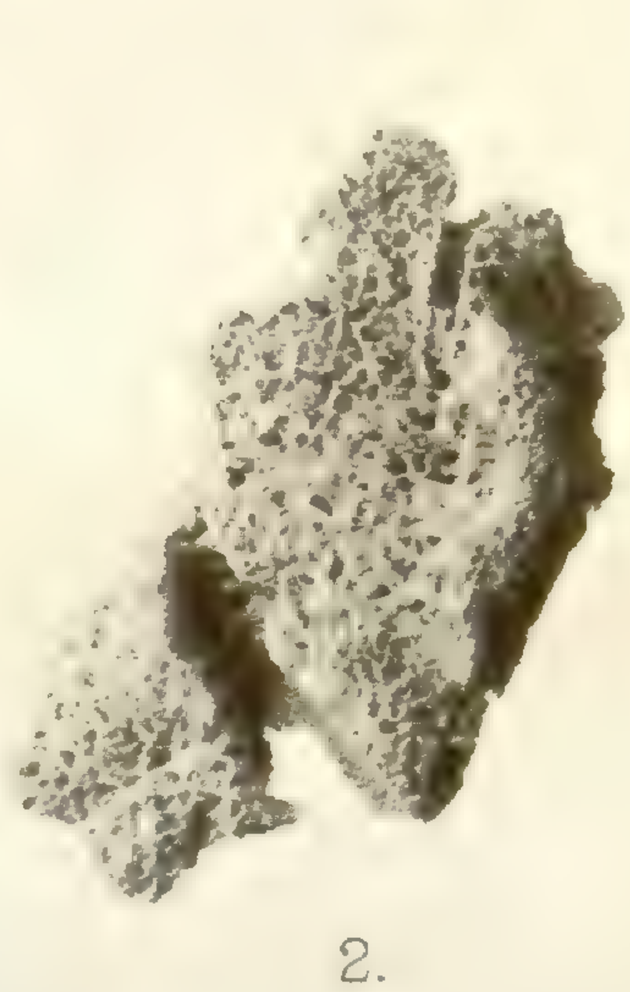
1.

4.

1a.



3.



2.

Photo by A.C. Chowdhary,

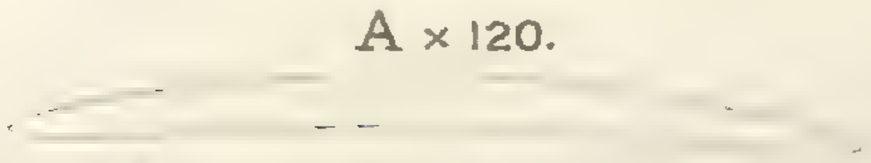
Bemrose, Collo., Derby.

SPONGES FROM THE LAKE OF TIBERIAS.

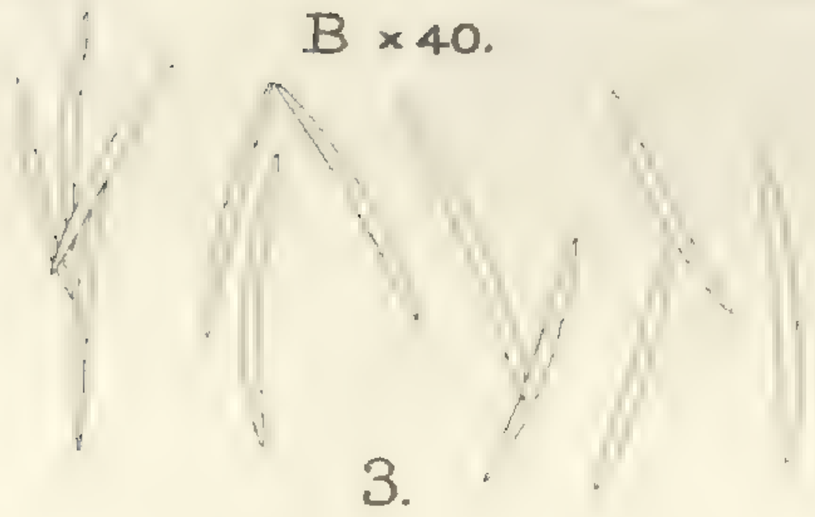
3a. × 20.

2a. × 20.

A × 120.

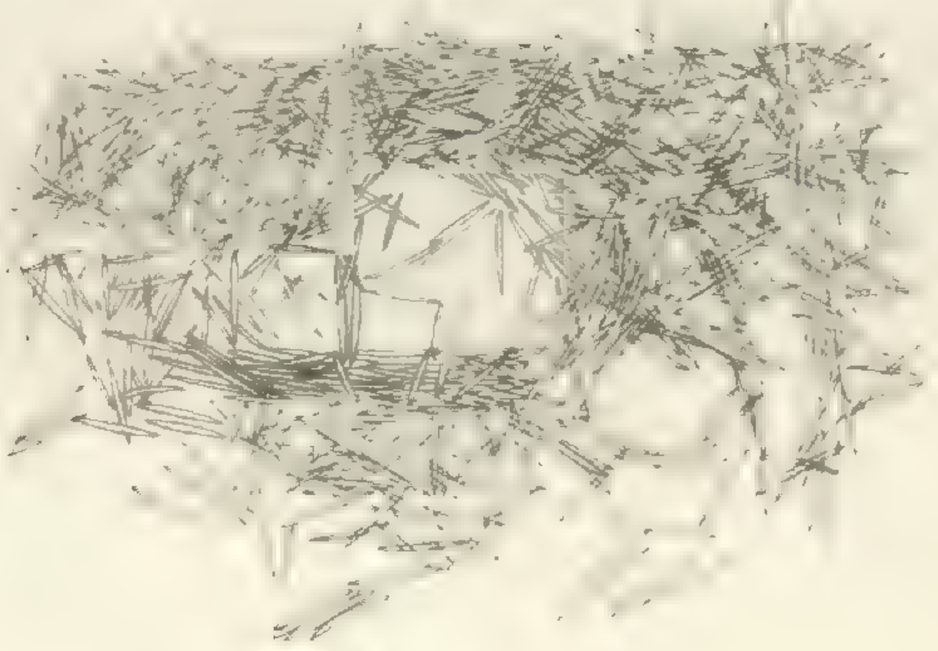


B × 40.



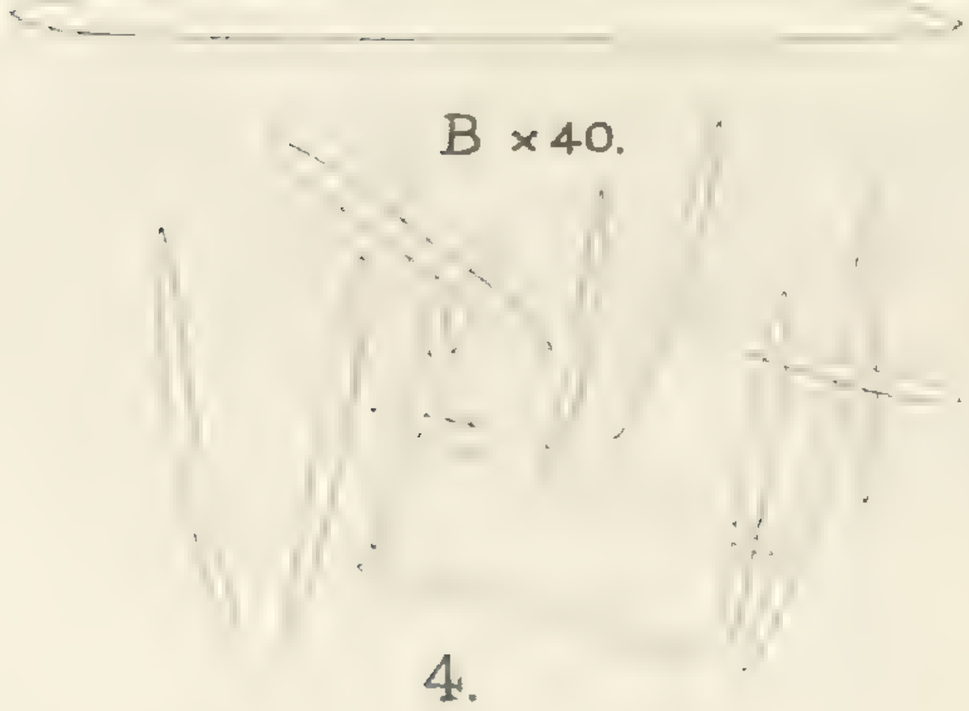
3.

A × 120.



4a. × 20.

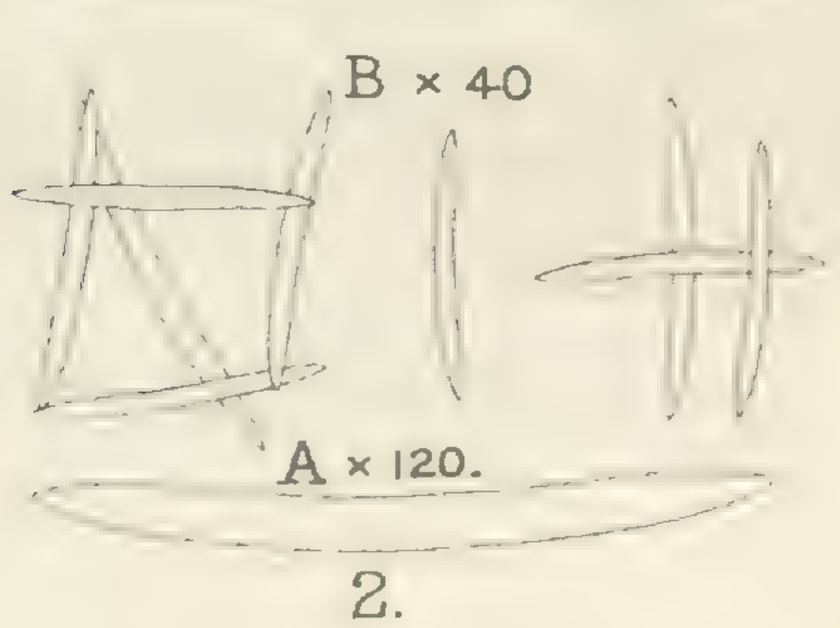
A × 120.



B × 40.

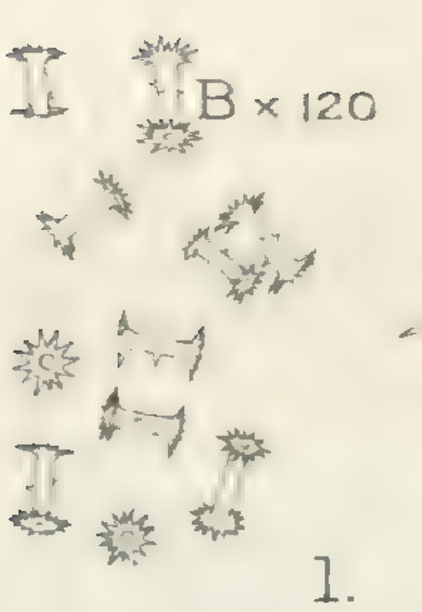
4.

B × 40



A × 120.

2.



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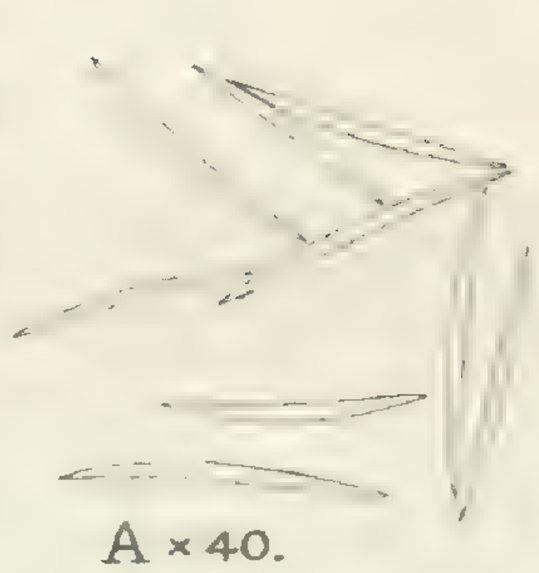

1.

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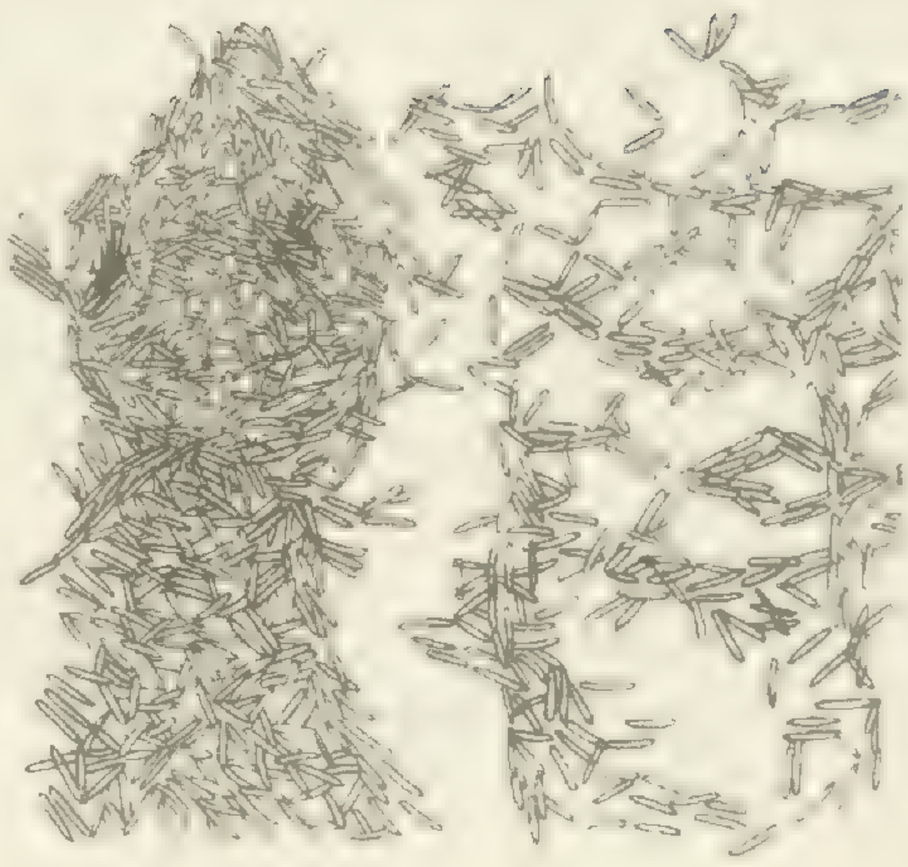
5. × 40.

D. N. Bagchi, del.

Bemrose, Collo. Derby.

SPONGES OF THE LAKE OF TIBERIAS.

3. × 16.



1. × 16.

5. × 16.

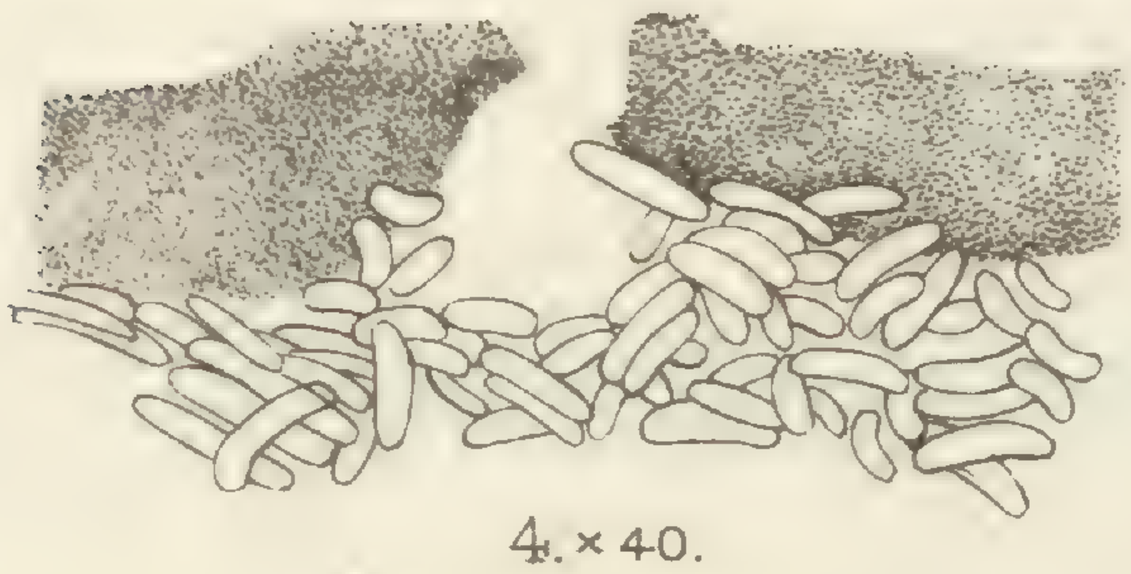
2. × 16.

4. × 16.

D. N. Bagchi, del.

Benrose, Colln., Derby.

SKELETON OF FRESHWATER SPONGES.



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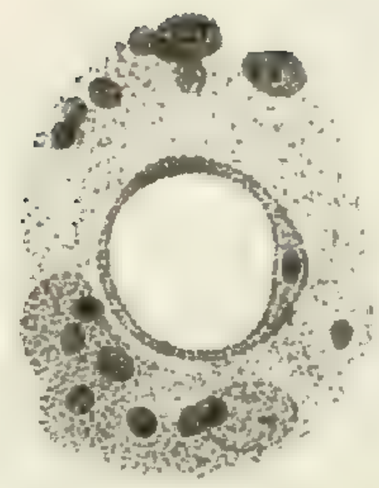

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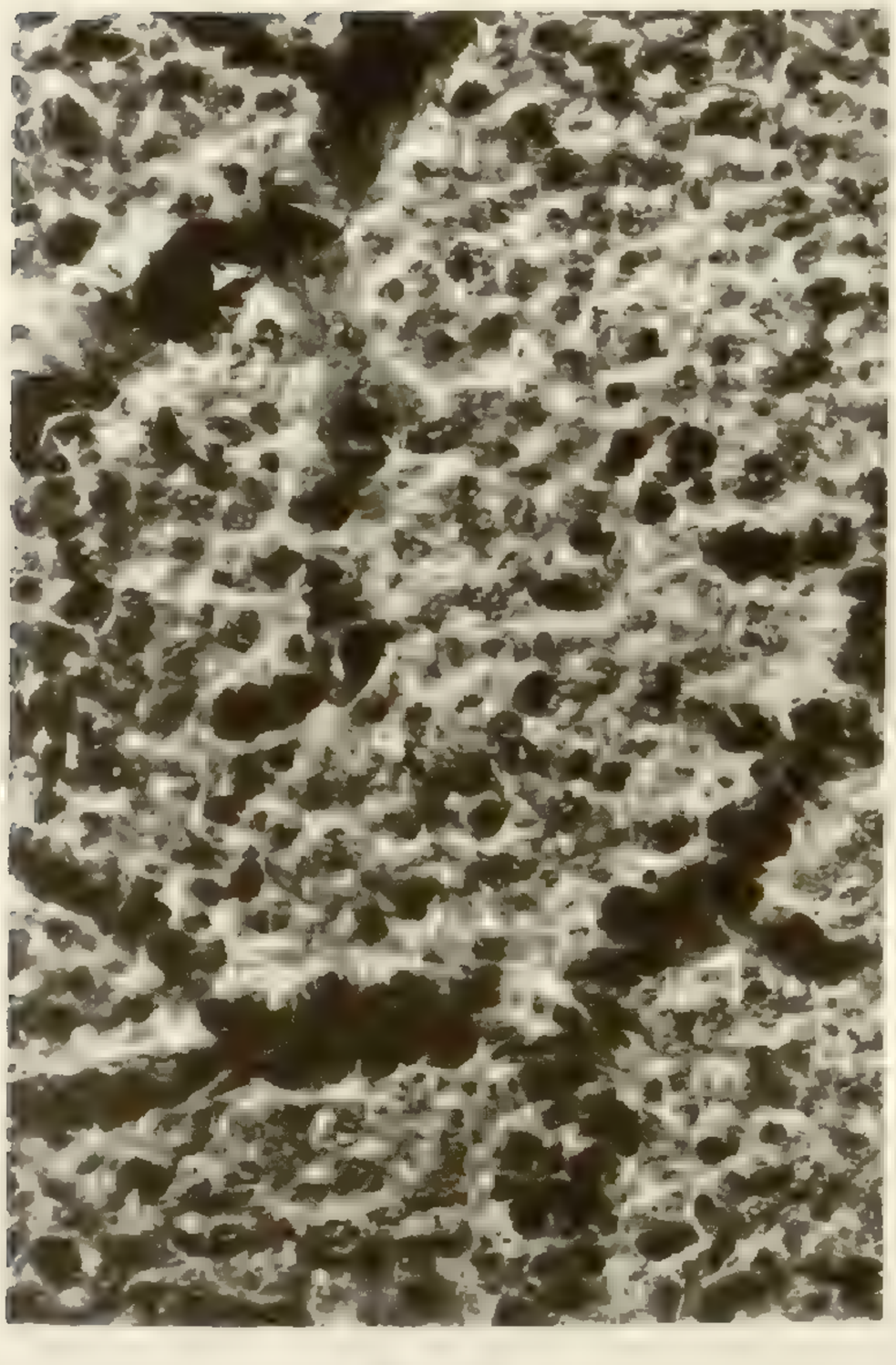

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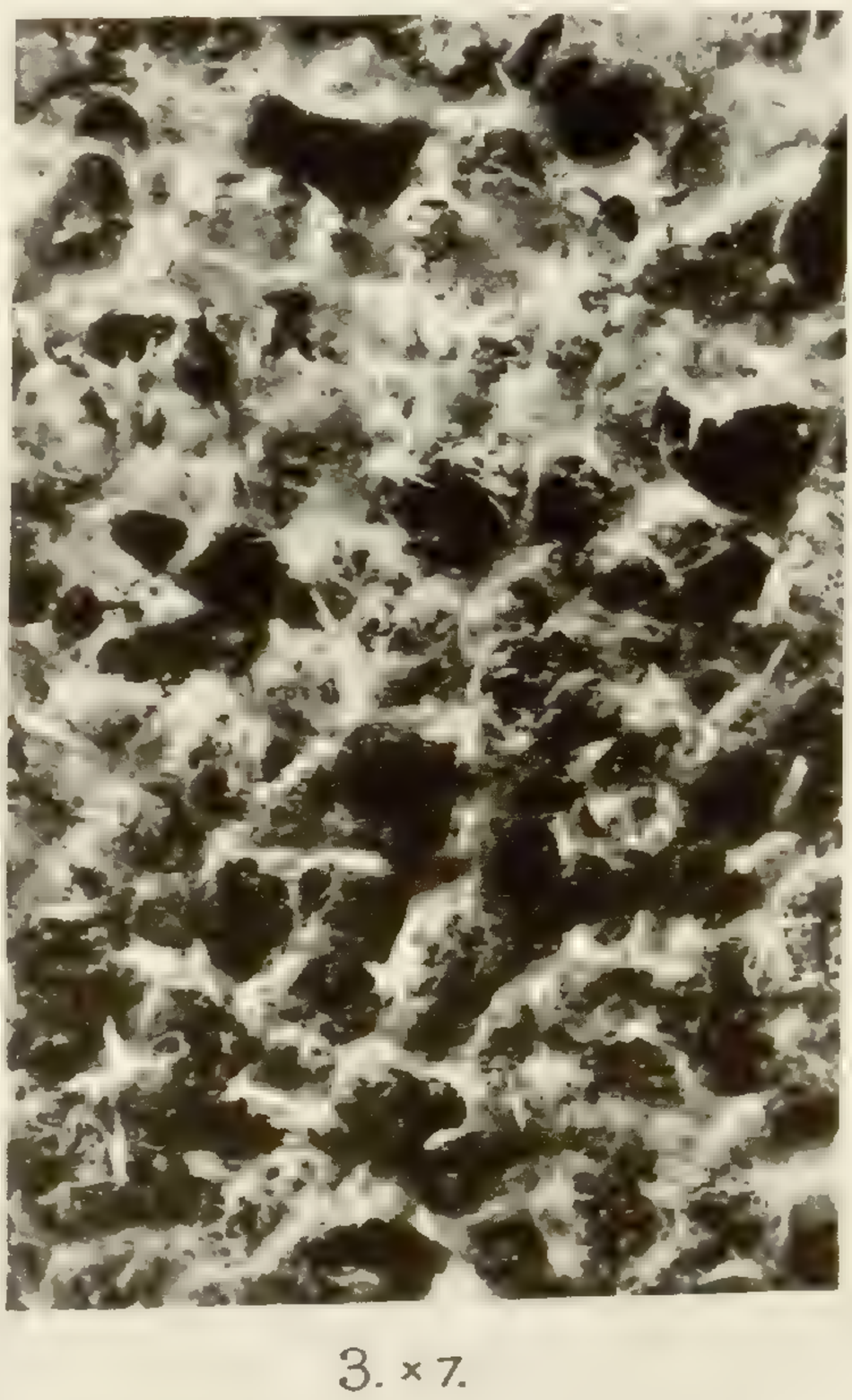

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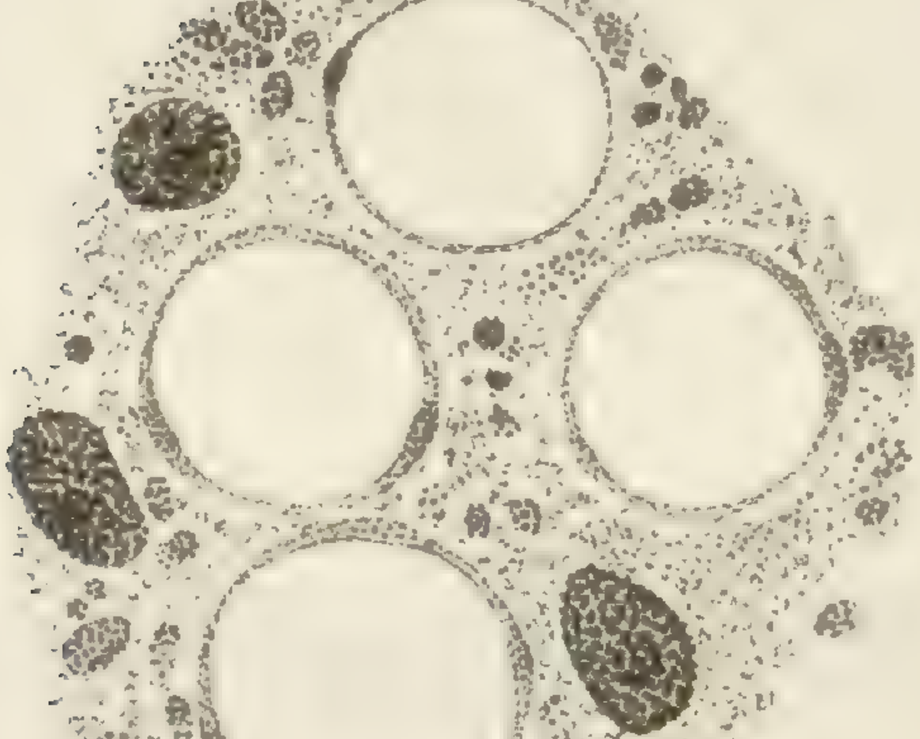

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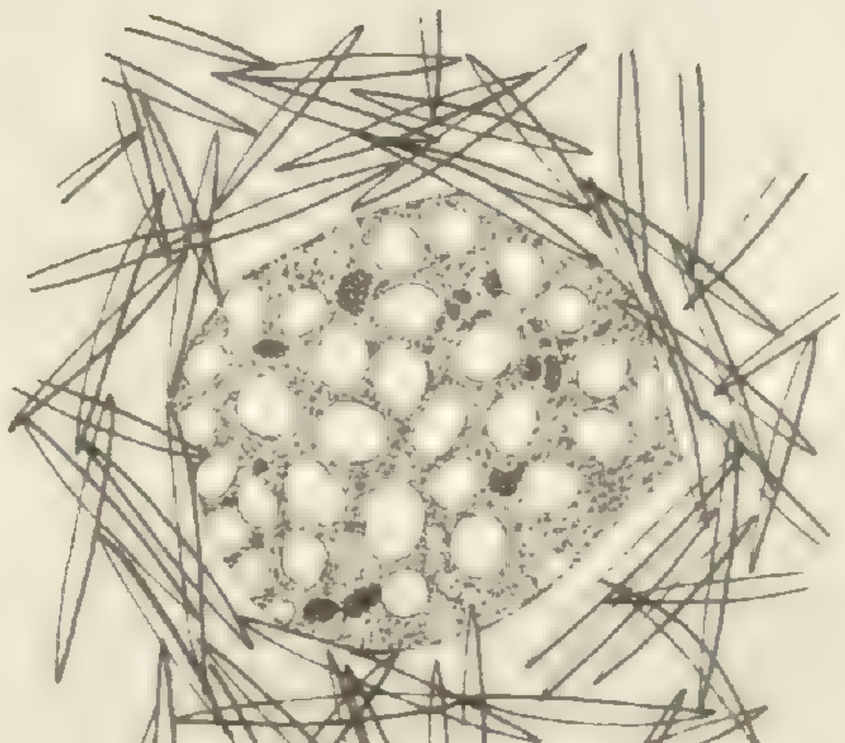

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S. C. Mondul, del.

Bemrose, Collo., Derby

DERMAL PORE-CELLS, ETC., OF SPONGILLIDAE.

9. The Marriage Ceremony and Marriage Customs of the Gehara Kanjars.

By W. KIRKPATRICK.

The "bride price" among these people is "nine twentys,"[1] or one hundred and eighty rupees for a virgin, and in the case of a widow "six twentys," or one hundred and twenty rupees. The father of the bridegroom is liable for this payment to the bride's family, or if the bridegroom is adult he has to pay the "bride price" himself. The "divorce price," which the bridegroom is also liable for, is similarly "nine twentys" in the case of a bride who was a virgin or "six twentys" in the case of a widow. In addition to this the council or *panch* apparently keep an account of all the expenses incurred from the day of betrothal and the sum total of these have also to be paid for by the new husband to the divorcée.

The *pour parlers* connected with the betrothal are intricate. When it is more or less decided who is an eligible bride, and the bride's party are agreeable to receive the advances of the bridegroom's party, the latter open negotiations by sending a messenger to the bride's party or sept or family with Re. 1-4. (twenty annas), and a formal request for an interview or meeting. The message is received and considered by the bride's party with much ceremony and the merits and demerits of the bridegroom and his 'side' or party or sept are freely discussed. If the request or "offer" is accepted, as it usually is, the preceding negotiations being part of the formality, a meeting is arranged and both parties meet together with practically the whole encampment in attendance, the communal Panchayat are feasted by the bridegroom's party, up to Rs. 5 or Rs. 10 being distributed in *dáru* (country spirit) and *bátásás* and sweetmeats. The Panchayat offer the first glass or cup of wine to the bride's guardian, and in this glass or cup is placed a rupee. Having quaffed the wine and possessed himself of the rupee the bride's guardian stands up and announces, "I have given away the girl." The whole party, or it may be only the immediate relations of the bride and bridegroom, now form a procession and walk round in a circle seven times. This is on the first of the seven days during which the marriage ceremony continues, and on this first day, what is described as a Mundha (or "head-dress") is prepared. The Mundha which I saw was a plain bamboo stuck in the ground, of about 5 or 6 feet long, on the top of which was tied a bunch of grass or

[1] See J.A.S.B., Vol. VII, No. 6.

reeds and *khas khas*[1]; in the middle of this grass a *lota* full of water was placed. In the case of a widow marrying I was told that instead of a plain bamboo a *gaidala* or bamboo with a rough iron spear head was used. This *gaidala* is the implement used by Kanjars and allied tribes of the "hunting state" for digging for *khas khas* roots and killing wild animals. To return to the first day's ceremonies; after this *Mundha* has been set up, oil is distributed to everybody taking part or interested in the ceremony. In the next five days the marriage ceremony proceeds to the extent that everybody meets in the evenings, and a certain amount of feasting and drinking goes on which is supposed to include or conclude with the bride and bridegroom walking once round the *Mundha*. On the seventh day all the really important events take place and the details are remarkably interesting. No doubt in various camps, as Hindu influence increases and as time goes on, the ceremonial is varied according to the inclinations and tastes of individual Chowdhris (Headmen) and their *Panch* or counsel, but for all that there is strong evidence of the survival of many primitive customs.

On the seventh day the bridegroom and his attendants proceed to the hut or encampment of the bride carrying with them two *chattis* or *gharrás* of earthenware—filled with water—and after an immense amount of discussion and issuing of instructions by every one who has ever been at a wedding before, and wrangling and shouting as a sort of preliminary to emphasize the importance of what is about to take place, the first part of the ceremony begins with what is called *Cowri Khélná*—playing with cowri shells. First one *ghara* of water is placed in front of the bridegroom and the other before the bride—they are said to be "given to them." The water from the bride's ghara is then mixed with the water in the bridegroom's ghara and *vice versa*. The eldest "son-in-law" of the *góth* or sept of the bridegroom then places seven *cowri* shells in each *gharú*. It should be noted that these people are

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[1] The following note is from "Hobson-Jobson," Yule and Burnell, p. 219: "Pers. *H. Khaskhas*. Proper Hindi names are *usīr* and *lāla*. The 'roots of a grass which abounds in the drier parts of India, viz. "*Andropogon muricatus* (Retz), used in India during the hot dry winds to "make screens which are kept constantly wet in the window openings, "and the fragrant evaporation from which greatly cools the house . . . "These roots are well known in France by the name *Vetyver*, which is "the Tamil name *Vetliveru* (*ver* = root)."

Digging for khaskhas roots and making *tatties* therefrom is to this day one of the principal of the "peaceful" avocations of those people in Delhi—and I fervently hope that whoever has the ordering of the hundreds of tatties which will now be required for the offices and residences of officials in the new capital will place his orders direct with the manufacturer, the Gehara Sanjar, and not through some humbugging middleman.

divided up into exogamous septs so that the "son-in-law" of the bridegroom's sept necessarily belongs to another sept and is not a blood relation—see Exogamous Septs of the Gehara Kanjars, J. & P. A.S.B, vol. VII, No. 10. The bride and bridegroom are now seated with their respective *gharas* in front of them and at a signal they simultaneously make a grab for the *cowries* in the water. If the bride 'grabs' more *cowries* out of her *ghara* than the bridegroom does out of his she is declared to have *jitgiá*—or won, and the winner is greeted with applause and much laughter. The suggestion of course is obvious and the idea simple—that if the bride for instance 'wins' she will have the upper hand all through life, and *vice versa*; but as the grabbings are repeated seven times the chances are very even so that in the end the honours are divided and the "indications" usually are that the marriage will be a happy one. The couple are now taken apart by their respective relations and are bathed in the water from their *gharas*—and are then dressed in clean clothes. And now comes the second item of the ceremonies; a crown of grass or *khas* made to roughly represent the crests of a peacock and peahen are put on the heads of the bridegroom and bride respectively and they are acclaimed loudly as the *Mor* (peacock) and *Morni* (peahen). As these characters and thus arrayed, the bride is hoisted on to the shoulders of the "eldest son-in-law" of her family and the bridegroom is similarly mounted on to the shoulders of the eldest son-in-law in his family. The crowd forms a ring round and a mock combat takes place. The bride and bridegroom are each armed with an imitation *Khanda* or large knife made of *sirkhi*[1] (*Saccharum sara* Roxb.) in one hand and a *chunni* or *chaj*, a sort of sieve made also of *sirkhi*, in the other. This *cháj* represents a shield. A few grains of rice are thrown into each *cháj* and in the air. The *Khanda* is, I am told, a weapon the tribes' forefathers used for decapitating cattle. After a few rounds the combat concludes and the bride and bridegroom are led to the *Mundha* or bamboo pole at the foot of which a fire is kindled with *ghi* and *dhup* or *lobán* (incense). The clothes of the contracting parties are tied together in a knot and the now united couple solemnly walk round the fire seven times. After the combat all horse-play ceases and the subsequent ceremonies are treated with proper solemnity. Having walked round the *Mundha* and fire for the seventh time the bridegroom leads his bride to his house or 'camp' where the knots are "united." This practically concludes the ceremony. Except that after the knots are tied the couple proceed to the bride's camp or house and "take salaams." The bride

[1] *Sirkhi-wallah*—"the reedmat folk"—is a common descriptive title applied to an aggregate of tribes of a gypsy-like character all over the United Provinces.

groom here is formally presented with one rupee, whereupon he orders wine to be brought—and all the Panch assemble and accounts are made of the actual expenses incurred by the bridegroom. In these accounts are included the cost of a hog which the bridegroom has had to provide during the ceremonies. As an alternative to a hog he may give Rs. 10. This hog or the Rs. 10 is distributed as follows :—

$\frac{1}{2}$ of the hog or Rs. 5 goes to the bride's party,
$\frac{1}{4}$ of the hog or Rs. 2-8 goes to Panchayat, and
$\frac{1}{4}$ of the hog or Rs. 2-8 goes to the bridegroom's party.

These are recognized fees and are called *Khhari Tekha*. When the accounts have finally been "found," the total is recorded as being the price the husband shall recover from the co-respondent in the event of a divorce.

There is one little detail of the ceremony which is interesting to record. On to the bamboo pole or *Mundha* very often a wooden representation of a parrot is tied. Now a parrot is one of the general totems of the tribe and is with the dog about the only live creature which they may not and do not kill or eat.

10. A Comparative Vocabulary of the Language of European Gypsies or Romnichal, and Colloquial Hindustani.

By W. KIRKPATRICK.

According to the Shah Nameh of Firdausi it was during the fourth or fifth century A.D. that Behram Gour (A.D. 420) received into Persia from India some ten or twelve thousand musicians of both sexes who were known as *Lūrīs*. It had been reported to him that the indigent classes of his kingdom drank wine without music and to "remedy the privation complained of" Behram Gour sent to Shankal, King of Kanauj, for "ten thousand male and female who play upon the lute." There appears to have been an attempt to settle these Lūrīs in Persia, each individual being given a cow and an ass and assigned an appropriate residence, just as to-day we are attempting to settle the Doms near Gorakhpur or the Haburas near Aligarh.

But these Lūrīs, even fourteen hundred years ago, showed no liking for a settled life; they "consumed all their wheat as "well as their cows and toward the end of the year were left "shamelessly destitute. The king rebuked them for their "lavish conduct and then dismissed them with an order that "taking their asses they should load them with their chattels "and support themselves by means of their songs and the "strumming of their silken bows." The Lūrīs agreeably to this mandate "now wander about the world seeking employ-"ment, associating with dogs and wolves, and thieving on the "road by day and by night." Thus wrote Firdausi nine hundred years ago!

The Gypsies in Persia to this day are called *Lūrīs*. Another Arabian historian, Hamza of Ispahan, we have it on the authority of De Goeje confirms this fifth-century Lūrī migration. Hamza appears to have written some fifty years earlier than Firdausi, and this author relates that Behram Gour caused 10,000 musicians called *Zott* to be sent from India to Persia. And Zott is the name by which Gypsies are known in Damascus at the present day.[1] Elliott, "History of India," p. 465, described these Zotts as *Jats* and says many were found in Irak, Syria and Mesopotamia and were soon changed into the Jatano or Gitano, the Gypsies of Modern Europe! The

[1] See "Contribution to the History of the Gypsies" by M. J. De Goeje—in MacRitchie's "Gypsies of India."

Zotts or Jats in Turkey who are also known as Tchinjane we may take to be the same as the Zingani, Zingari or Zigeuner and are identical with the Persian Lūrīs who in Palestine are called *Zatts* or *Nawari* or *Nauri* or *Nuri*. From here the gypsiologist will trace the migration to Western Asia and South-East Europe, and we finally have definite proof of the location of Gypsies in Europe for the first time in Hungary in 1417.[1] From this date we hear authoritatively of the Zigeuner or Zingaro or Gypsy race spreading all over Europe into Roumania, Wallachia, Roumelia, Bulgaria and Transylvania and all speaking a veritable Gypsy language.

"They are all so alike," says Borrow, speaking of various European Gypsy dialects, "that he who speaks one of them can make himself very well understood by those who speak any of the rest."

Although I do not accept the linguistic test as by any means an infallible test of pedigree, it is no mere assumption to ascribe the obviously Oriental, if not actually Indian, origin of European Romnichal to the Lūrī migration mentioned by Firdausi.

I do not pretend that the comparative list of words I have here collated is any more than a revision of similar vocabularies which are familiar to anyone interested in Gypsy lore, but I have, I believe, identified a certain number of words which appear to have been unnoticed by either Lieutenant Irvine in his paper "On the similitude between the Gypsy and Hindi languages" which appeared in the "Transactions of the Bombay Literary Society of Bombay, 1819," or by Colonel John Staples Harriott in a paper which he read before this Society in 1822 on the "Oriental Origin of the Gypsies." In his paper Colonel Harriott gives a "Comparative vocabulary of the Gypsy "Dialect with a variety of synonyms deduced chiefly from "the Hindu, or Language of Hindustan." This is the most comprehensive and knowledgeable comparative list of Romnichal and Hindustani or Urdu words I have yet come across.

In a collection of words of the language of the familiar Indian Gypsies known as Kanjars (see J.A.S.B., vol. vii, No. 6) I have come across three or four words which I find to be common to Romnichal and the Argot of the Kanjars alone and to no other languages or dialect that I know.

Romnichal.	*Kanjar.*
Mailla, *Myla*, an ass.	*Mail*, a horse.
Jookal, *Jukel*, a dog.	*Jhukal*, a dog.
Lubni or *Loobni* or *Luvni*, a wench.	*Loobhar* or *Lubhar*, a woman.

[1] See "Contribution to the History of the Gypsies" by M. J. De Goeje—in MacRitchie's "Gpysies of India."

Note.—There is a striking similarity of purpose in the Romnichal use of the affix *mengro* (or *engro* when the word to which it is affixed ends in a consonant) and the colloquial use of the affix *wala* or *wallah* in Hindustani. *Mengro* and *engro* are used in fact by European Gypsies just as *wala* would be used by Europeans in the patois which serves for Hindustani in Calcutta. This word (*engro*), says Borrow, "affixed to a noun or verb turns it into something figurative, by which they designate, seldom very appropriately, some object for which they have no positive name"; remarks which apply equally to the use of *wala* in colloquial Hindustani.

Borrow himself gives as example "*kawn engro*," which signifies ear-fellow—a hare; in Hindustani patois one would say *wo kan wala jānwar*: that ear-fellow animal!

In Romnichal *o* represents the masculine and *i* or *ni* the feminine, for example *rom* a man or bridegroom, *romni* a woman or bride; or *boro rei* a great gentleman and *bori rani* a great lady. In Hindustani we have *jat*, *jatni*; *dom*, *domni*; *barrā rāja*, or *bara rāis*; *barrī rāni*, and so on.

Though I dare say it is of no philological interest I would draw attention to what has struck me as an apparent similarity in the pronunciation of some Hindustani words by Bengalis and by Romani Ryes.

	The Romnichal word is	In Bengali it is pronounced
For instance.—*Barā*, big, great	.. *boro*	*Borro.*
,, *Nangā*, bald, naked	.. *nongo*	*Nongo, longo.*
,, *Sūkha*, dry	.. *shuko*	*Shuka.*
,, *Dūsrā*, second	.. *duito*	*Duito.*
,, *Kal* or *Kalko*, to-morrow	*kolko*	*Kol.*
,, *Do*, two	.. *dooi*	*Dooi.*

and so on.

My Romanes vocabulary I have taken almost entirely from Smart and Crofton, a few words from Borrow and also from Colonel Harriot's paper.[1] Smart and Crofton have relied for the identification of many words in their vocabulary on Paspati in his "Etudes sur les Tchinghianes" and on Dr. Liebick in his "Die Zigeuner," etc

The strongest argument which can be used in support of Romnichal being Indian in origin is supplied by the etymology of the words of this vocabulary, in that some of the words are clearly Sanskrit while others are of Persian origin.

[1] See Bibliography given in Pasi Boli of Kanjars, J.A.S.B., vol. vii. No. 6.

English.	*Gypsy.*	*Hindustani.*
Above ..	*Opré* ..	*Ūpar.*
Ache ..	*Dooker* ..	*Dukh.*
Aged ..	*Pooroben* ..	*Būrhā* and *pūrī ūmr, pūrānā.*
Acquaintance ..	*Jin* ..	*Chīn, janna.*
Alive ..	*Jido, jivo* ..	*Jītā, zinda* (dialectic).
Air ..	*Baval* ..	*Bāo, bayar* (*bādāl* a cloud).
All ..	*Sa, sor* ..	*Sārā.*
Ancient, old ..	*Pureno* ..	*Purānā.*
Ant ..	*Kreea* ..	Compare *kirá*, an insect.
Ask ..	*Pootch* ..	*Pūchh.*
Asleep ..	*Sooto* ..	*Sota.*
Ass ..	*Meila* ..	*Mail* is a horse in Kanjar Argot.[1]
Awake ..	*Jongar* ..	*Jāgnā.*
Back ..	*Doomo* ..	*Dúm*, a tail.
Bag (see sack) ..		
Bald ..	*Nongo* ..	*Nangā*, naked.
Bare ..	*Nongo*	*Nanga*, naked.
Barefoot ..	*Nongo Peero* ..	*Nanga pair.*
Beak ..	*Chiriklesto nok* ..	*Chiria ki nak* would be a bird's nose.
Belly ..	*Per* ..	*Pēt.*
Beef ..	*Mooshkeno, Mas* ..	*Mas*, meat.
Before ..	*Agal* ..	*Āge*
Beg ..	*Mong* ..	*Mang.*
Beneath, below	*Tale* ..	*Tale.*
Big ..	*Bauro, boro* ..	*Barā.*
Bird ..	*Cheriklo* ..	*Chiṛyā*
Bite ..	*Dander, dan* ..	*Dāṅt mārnā*, to bite.
Black ..	*Kaulo* ..	*Kālā.* A Bengali would pronounce *kala* as *kaulo.*
Blanket ..	*Coppur* ..	*Kaprā.*
Born ..	*Beeno, beano* ..	*Biyāī*—given birth to.
Both ..	*Dooi*	*Donoṅ.*
Boy, lad	*Raklo* ..	*Laṛkā.*
Breast	*Tootchi, cuci* ..	*Chūchī.*
Bristle	*Baulesko, bál* ..	*Bal* is Hind. for hair.
Broad ..	*Bauro* ..	*Baṛā sā, chowrā sā* would be very broad.

[1] See J.A.S.B., vol. vii, No 7, pp. 368 *et seq.*

English.	*Gypsy.*	*Hindustani.*
Brandy ..	*Tatto paani* ..	Hind. *tatta* is hot and *pāni* water.
Bride ..	*Romni* ..	Compare *Dom* and *Domni*, a Dom woman; "*r*" is very commonly convertible with "*d*," *ni* is a common Hind. feminine termination.
Bridegroom ..	*Rom* ..	
Candle ..	*Mumbli* ..	*Mum*, wax.
Chill ..	*Bauroshil* ..	*Baṛā sīl*, very damp.
Chamber ..	*Kamora* ..	*Kamrā.*
Clergyman ..	*Rashi* ..	*Rishī*, a saint or sage.
Coal (fire) ..	*Wongar, wangar* ..	*Angār*, embers.
Cold ..	*Shil* ..	*Sil.*
Comb, *n.* ..	*Kongali, congli* ..	*Kanghī, kanghā.*
Comb, *v.* ..	*Konga* ..	*Kanghī, kavnā.*
Coat ..	*Choka* ..	*Choghā*, an overcoat
Come ..	*Av, Avel* ..	*Aó, ā.*
Copper ..	*Hauro* ..	*Harā*, green.
Corn ..	*Ghiv* ..	*Gehūn.*
Count ..	*Ghinya, gin* ..	*Gin'nā.*
Cow ..	*Groovni* ..	*Górū.*
Create ..	*Kir* ..	*Karnā.*
Crow ..	*Kaulo chiriklo* ..	*Kālī chiryā*, black bird.
Crown (5*s.*) ..	*Pansh kola* ..	*Pānch*, five.
Cross ..	*Trihool* ..	*Tirsūl.*
Cry ..	*Rov* ..	*Ronā*, to cry.
Do, to ..	*Kair* ..	*Kar.*
Dance ..	*Kel* ..	*Khēl*, to play.
Dark ..	*Kaulo* ..	*Kālā sā.*
Die ..	*Mer* ..	*Mar.*
Did, he ..	*Kerdo* ..	*Kar diya.*
Distance Distant	*Door*	*Dūr.*
Dog ..	*Jookel* ..	*Jhukal*, is Kanjar Argot for dog.[1]
Drink ..	*Pee* ..	*Pī* and *pīnā*, to drink.
Dry ..	*Shooko* ..	*Sukhā.* By a Bengali, the Hind. word would be pronounced very like *shooka.*
Drunk ..	*Motto, mato* ..	*Matwālā.*

[1] See J.A.S.B., vol. vii, No. 7.

English.	*Gypsy.*	*Hindustani.*
Dirt, earth ..	*Chik* ..	*Kīchar*, muddy; *chhi*! *chhi*! an exclamation, filthy, dirty.
Ear ..	*Kán, kaun* ..	*Kān.*
Eight ..	*Oitoo* ..	*Āṭh.*
Eye ..	*Yok, yak* ..	*Ānkh.*
Equal, alike ..	*Simen* ..	*Samān.*
Face ..	*Mooi* ..	*Muṅh.*
Famine ..	*Bauro bukaloben* ..	*Barī bhuk*, great hunger.
Far ..	*Door* ..	*Dūr*
Fasten ..	*Pander* ..	*Bāndhnā.*
Father ..	*Dad, ba* ..	*Abbā, bāp*, father; *dadā*, grandfather.
Feather ..	*Pur, Por* ..	*Par.*
Finger ..	*Vongusti* ..	*Aṅgusht.*
Fire ..	*Yog* ..	*Ag.*
First ..	*Yekto* ..	*Ek*, one.
Fish ..	*Matcho, matchi* ..	*Machhi, machhlū* or *machhli*
Five ..	*Pansh, pansch* ..	*Pānch.*
Flea ..	*Pisham, pishen* ..	*Pissū.*
Flour [1] ..	*Atos* [1] ..	*Atā.*
Foot ..	*Peero, piro* ..	*Pair, pāoṅ*, feet
Gentleman ..	*Rei* ..	*Raīs.*
Girl ..	*Rakli* ..	*Laṛkī*, a form of transposition common in all Indian dialects.
Give ..	*Del, De* ..	*Dē* (*denā*).
Go ..	*Jova, jaw* ..	*Jāo.*

[1] In a grammar and vocabulary of the "Nawar or Zutts the Nomad Smiths of Palestine," Journal of the Gipsy Lore Society, vol. iii, No. 4, by R. A. Stewart Macalister, M.A., F.S.A., out of 16 words given as examples of a few words nominative singular which end in consonants we see a remarkable similarity to modern colloquial Hindustani.

English.	*Zutli.*	*Hind.*
Tongue	.. *Jib*	.. *Jīb.*
Fire	. *Ag*	.. *Āg.*
Flour	.. *Atos*	.. *Ātā.*
Grandmother	.. *Dad*	.. *Dādī.*
Tinder	.. *Cokmak*	.. *Chakmak.*
Sister	.. *Bēn*	.. *Bahin.*
Snake	.. *Sāp*	.. *Sānp.*
Night	.. *Arat*	.. *Rāt.*

English.	*Gypsy.*	*Hindustani.*
Goat ..	*Lavines bokro.* *Lavines* is a common Gypsy or Romnichal prefix	*Bakrā, bakrī.*
Gold ..	*Soonakei* ..	*Sonā.*
Good ..	*Kooshko* ..	*Khush*, happiness.
Grandmother ..	*Bauri-dei, dade* ..	*Dadī*, grandmother; *dayyā*, mother.
Great ..	*Bauro* ..	*Baṛā.*
Hair ..	*Bāl*	*Bāl.*
Happiness (see glad) ..	*Kooshko-bok* ..	*Khushī.*
He ..	*Yo*	*Wuh.*
Hark ! ..	*Shoonta* ..	*Suno.*
Harlot ..	*Lubni* ..	In Kanjar Argot *lubhar* (see J.A.S.B. No. 7, vol. vii).
Head ..	*Shēro*	*Sīr.*
Hawker ..	*Bikomengro* ..	*Bikrī-wālā.*
Hay ..	*Kas, cās* ..	*Kās*, rushes, reeds.
Heart ..	*Zee*	*Ji*, life, soul, spirit, mind.
Heat ..	*Tattoben* ..	*Tatta*, very hot (colloquial).
Hear ..	*Shoon* ..	*Sūn.*
Horn ..	*Shing* ..	*Sīng.*
Hide ..	*Garav, gara* ..	*Gāṛnā*, to bury.
Hunger ..	*Bok*	*Bhūk.*
House ..	*Ker*	*Ghar.*
Hungry ..	*Bokalo* ..	*Bhūkā.*
Hurt ..	*Doóka* ..	*Dukh*, ache, pain.
I ..	*Mi, mē, maudi* ..	*Main.*
Injure ..	*Dooka* ..	*Dukh*, pain.
Kill ..	*Maur* ..	*Mār dāl nā.*
Kiss ..	*Choóma* ..	*Chummā.*
Knife ..	*Choori* ..	*Chhurī.*
Know ..	*Jin*	*Jānnā* or *chīnnā*, to distinguish.
Lady ..	*Beebi* ..	*Bībī*, a wife.
Lady ..	*Rauni* ..	*Rānī.*
Lame ..	*Lango, long, lang*	*Langṛā, lang*, limp
Large ..	*Bauro* ..	*Baṛā.*
Leaf ..	*Patrin* ..	*Pattā.*

English.	*Gypsy.*	*Hindustani.*
Leather ..	*Cham* ..	*Chamṛā.*
Lice, louse ..	*Ju, joové, joovas* ..	*Jūn, jooi.*
Listen ..	*Shoon* ..	*Sun!*
Live ..	*Jiv*	*Jī*
Long ..	*Door*	*Dūr*, far.
Very long way ..	*Dooveri—doovori* ..	*"Dūr dūr."*
Look ..	*Dik*	*Dēkh.*
Louse ..	*Joova, Ju* ..	*Jūṅ, jovi.*
Love ..	*Kam*	*Kām*, love, desire.
Maid ..	*Rakli*	*Laṛkī.*
Man, old ..	*Puru manoosh* ..	*Pūrī 'umr*, full age.
Man ..	*Gairo, manoosh* ..	*Mānus*, colloquial Hind. in U. P.
Meal ..	*Kona* ..	*Khānā.*
Meat ..	*Mas* ..	*Mās, Māṅs.*
Meddle ..	*Chārvo, chāra* ..	*Chheṛnā.*
Milk ..	*Tood* ..	*Dūdh.*
Moon ..	*Chein* ..	*Chānd.*
Mother ..	*Dei* ..	*Dāī*, a foster-mother; *dāya*, oh mother.
Mourn ..	*Rov* ..	*Ro, Ronā.*
Mouth ..	*Mooi* ..	*Muṅh.*
Much ..	*Booti* ..	*Bahut.*
Muck, Mud, Muddy, Filth, Dirt	*Chik*	Cf. Hind. *kīchaṛ*, muddy; also *chhi!* = the expression filthy! Punjabī *chikar.*
My ..	*Meiro* ..	*Merī* or *merā.*
Naked ..	*Nongo* ..	*Nangā.*
Name ..	*Nav* ..	*Nām.*
Needle ..	*Sooy, su* ..	*Suī.*
New ..	*Neyē* ..	*Nayā.*
Night ..	*Raati, arat* ..	*Rāt.*
Nobleman ..	*Res, rai* ..	*Raīs, reis.*
Nose ..	*Nok* ..	*Nāk.*
Old ..	*Poōro* ..	*Purānā, pūrī 'umr*, full age.
On ..	*Opré* ..	*Ūpar.*
One, Once	*Yek* ..	*Ék.*
Ours ..	*Moro* ..	*Merā.*
Pain ..	*Dooka* ..	*Dukh.*

English.	*Gypsy.*	*Hindustani.*
Play ..	*Kel* ..	*Khel.*
Plank ..	*Kasht* ..	*Kāth.*
Plunder ..	*Loor* ..	*Lūt.*
Pray ..	*Mong* ..	*Mang*, ask, beg, pray.
Prostitute ..	*Lubni, Luvni* ..	The Kanjar dialect gives *Lubhar*, a wife. Cf. Sanskrit *Lūbha*, to inflame with lust, from which the English word love is derived.
Queen ..	*Rani* ..	*Rānī.*
Rabbit ..	*Shoshi* ..	*Sassā* (Sanskrit *sasāk*).
Reckon, count ..	*Gin* ..	*Gin.*
Rain ..	*Brishindo, brishen*	*Bārish, barsāt.* Sans. *brish.* Mod. Greek Βρέξιμον.
Red ..	*Lollo, lullo* ..	*Lāl.*
Red herring ..	*Loli matcho* ..	*Lāl machhi*, red fish.
Religious, converted ..	*Sherrafo* ..	Hind. noble, eminent = *sharīf*
Riband ..	*Dori* ..	*Dori.*
Rich ..	*Baryalo* ..	*Baṛā*, great.
Ring ..	*Vongusti, vongushi*	*Aṅgūthī.*
River ..	*Doriōv* ..	*Daryā.*
Roast ..	*Pek* ..	*Pakā.*
Rob ..	*Loor* ..	*Lūt.*
Room ..	*Kamora* ..	*Kamrā.*
Sack, see bag ..	*Gono, gunno* ..	*Cf.* gunny-bag.[1] Sans. *goni.* Mahratti, *gonigon*, a sack, sacking.
Saddle [2] ..	*Zen* ..	*Zin.*

[1] 1785, Tippoo's Letters, 171. "We enclose two *parwanahs* directing them each to despatch 1,000 goonies of grain to that person of mighty degree."

[2] In an article, Journal Gypsy Lore Society, p. 217, No. 3. vol. iv, by Augustus John, he gives a vocabulary from among which I have picked out:—

Romani.	*English.*	*Hindustani.*
Cuci ..	Breast ..	*Chūchī.*
Darana ..	Fear ..	*Dar.*
Kangli ..	Comb ..	*Kanghī.*
Pani, pai ..	Water ..	*Pānī.*
Suri ..	Knife ..	*Chhurī.*
Zen ..	Saddle ..	*Zīn.*

English.	*Gypsy.*	*Hindustani.*
Salt ..	*Lōn* ..	*Nōn, nūn, lūn, lon.*
Scent ..	*Soongimus* (it stinks, *sungella*)	*Sun̈ghnā*, to smell, active smell.
Scissors ..	*Catches* ..	*Qain̈chī.*
Sea ..	*Doriov, bauro pani londo pani* (salt water) ..	*Darya* (the sea, a river): *barra pani, lūnā pani.*
Second ..	*Duito* ..	*Dūsra.*
See ..	*Dik* ..	*Dekh.*
Sell ..	*Bikin, bik* ..	*Bikrī, bik gya*, sold.
Serpent ..	*Sap* ..	*Sān̈p.*
Sew ..	*Siv* ..	*Sī, silāī*, sewing. Sans. *siv.*
Sheep-stealing ..	*Bokra chorines* ..	*Bakri churānā.*
Sheep ..	*Bokro, Bokra* ..	*Bakri*, a goat.
Silver ..	*Roop* ..	Cf. *roopee, rūpya.*
Sing ..	*Ghit ghiv* ..	*Gīt*, song.
Single ..	*Yekind* ..	*Akelā.*
Sister ..	*Pēn, bēn* ..	*Bahin.*
Sit ..	*Besh* ..	Bengali, *bosho.*
Slay ..	*Maur* ..	*Mār.*
Sleep ..	*Sov, sooter* ..	*So, sonā.*
Smell (see scent)	*Soon, soongomūs* ..	*Soong.*
Soul ..	*Zee* ..	*Jī*, the heart, mind.
Son-in-law [1] ..	*Jamutro* ..	*Jamāī.*

[1] *Jamutro*, a son-in-law: see Journal of the Gypsy Lore Society, vol. iii, No. 4, p. 251. La Bella Chiavani—a French Piedmont Gypsy tale—mentions a Mr. Augustus John who took down in March (1910) a short vocabulary from some Gypsies of the Haute Savoie as they passed through Martigues. The following words occur:—

English	*Romany.*	*Hindustani.*
Father	.. *Ba*	.. *Abbā, bāp.*
Rain	.. *Brisindo*	.. *Barish.*
See (sight)	.. *Dik*	.. *Dikhaī dékhnā.*
Dog	.. *Jukel*	.. *Jookal* is the word for dog in the language of the Kanjars of Upper India.
Son-in-law	.. *Jamutro*	.. *Jamāī.*
To-morrow	.. *Kaliko*	.. *Kal, kalko.*
To do, make	.. *Ker*	.. *Kar, karnā.*
Nose	.. *Nak*	.. *Nāk.*
Thou	.. *Tu*	.. *Tū.*

English.	*Gypsy.*	*Hindustani.*
Snake ..	*Sap* ..	*Sāṅp.*
Spirits ..	*Tatto pāni* ..	*Tatta paṅi*, lit. hot water.
Stomach ..	*Per* ..	*Pet.*
Steal ..	*Chor* ..	*Chorī*, *chor*, a thief.
Stranger ..	*Perdas* ..	*Pardesī.*
Straw ..	*Poos*, *pus* ..	*Phūs.*
String ..	*Dori* ..	*Dorī.*
Sword ..	*Bauro choori* ..	Hind. *baṛī churi* is literally big knife.
Tailor ..	*Sunengro* ..	*Sina*, to sew ; *sui*, a needle.
Take ..	*Lel*, *lē* ..	*Le.*
Take care of ..	*Rak* ..	*Khabar-dāri sē rakh.*
Teeth ..	*Danyaw* ..	*Daṅt.*
Telescope ..	*Door-dikomengro* ..	*Dūr dēkknā*, see at a distance.
There ..	*Odoi* ..	*Udhar.*
Thief ..	*Chor*, *choromengro looremengro* ..	*Chor*, *lūtēra.*
Thine ..	*Teero* ..	*Terā.*
Throat ..	*Karlo*, *curlo* ..	*Gallā.*
Thou ..	*Too*, *tooti* ..	*Tū.*
Thy ..	*Teero*, *tooki* ..	*Terā.*
Tinder ..	*Cok mak* ..	*Chak mak.*
Tie ..	*Pander*, *pand* ..	*Band*, *bandhnā.*
Tell, declare, answer, speak ..	*Pukker* ..	*Pukārnā*, to call.
To-morrow ..	*Koliko*, *collico* ..	*Kal*, *kalko.*
(Yesterday) ..	*Callico* ..	*Kal.*
Tongue ..	*Chib*, *chiv jib* ..	*Jīb.*
Tooth ..	*Dan* ..	*Dāṅt.*
Town (see village) ..	*Gav* = town or village ..	*Gāon*, a village.
Trout ..	*Reieski matchi* (the gentle folks' fish)	*Reis* or *rais ki machchhi*, (the fish for gentlefolk).
True ..	*Tatcho* ..	*Sachchā.*
Turkey ..	*Kauli rani* (lit. black queen or lady) ..	*Perū*, *kālī rānī* in Hind. means black queen.
Twenty ..	*Bish* ..	*Bīs.*

English.	*Gypsy.*	*Hindustani.*
Two ..	*Dooi* ..	*Do.*
Uncle ..	*Koko* ..	*Chachā* (colloquial *ka ka*).
Up, upon ..	*Opre, apre* ..	*Upar.*
Urine }	*Muter, mutra* ..	*Mūt.*
Urinate }		*Mūtnā.*
Us ..	*Men* ..	*Maiṅ.*
Very ..	*Boot booti* ..	*Bahut.*
Village ..	*Gav* ..	*Gāoṅ.*
Walk ..	*Jal* also *peer, piriv*	*Pair*, foot or *phirnā* and *chal chālnā*, to walk.
Warm ..	*Tatto* ..	*Tatta* (colloquial) or *Thhāttā.*
Water ..	*Pauni, pani* ..	*Pānī.*
We ..	*Men* ..	*Maiṅ.*
Weep ..	*Rov* ..	*Ro, ronā.*
Whale ..	*Bauro matcho* ..	*Barā machchhi* = big fish.
Wheat ..	*Ghiv* ..	*Gehūṅ.*
Where ..	*Kah* (*kai tero ker* = where is your house) ..	*Kahān, kahan terā ghar*: where is your house ?
Who ..	*Ko, kon* ..	*Kaon.*
Wife ..	*Romi, romni* ..	Compare *dom, domni*: see bride.
Without ..	*Bi* (prep.) ..	*Bē.*
Wool ..	*Poosham* ..	*Pashm, pashmina.*
Wood (plank) ..	*Kasht* ..	*Kāth.*
Word ..	*Lav*[1] ..	*Lafz.*
Worm ..	*Kermo* ..	*Kīṛā.*
Year ..	*Besh, Bersh* ..	*Baras.*
Yesterday (see to-morrow) ..	*Koliko* ..	*Kal, kal ka.*
Yonder ..	*Odoi, adoi* ..	*Udhar.*
You ..	*Too, toot* ..	*Tū.*
Your, yours ..	*Teero* ..	*Terā.*

Numerals.

One ..	*Yek* ..	*Ek.*
Two ..	*Dooi* ..	*Do.*
Three ..	*Trin* ..	*Tīn.*
Four ..	*Stor* ..	*Chār.*

[1] Compare *Lavengro* or *Lavolil*, the Word Book of Romany.

English.	*Gypsy.*	*Hindustani.*
Five ..	*Pansh* ..	*Panch.*
Six ..	*Sho* ..	*Chhe.*
Seven [1] ..	*Afta* ..	*Sat.*
Eight ..	*Oitto* ..	*Ath.*
Nine ..	*Enneah* (or *desh sore-but ek*).	*Nao.*
Ten ..	*Desh* ..	*Das.*
Eleven ..	*Desh ta yēk* ..	*Das aur ek.*
Twelve ..	,, ,, *dooi* ..	,, ,, *do.*
Thirteen ..	,, ,, *trin* ..	,, ,, *tīn.*
Fourteen ..	,, ,, *stor* ..	,, ,, *chār.*
Fifteen ..	,, ,, *pands* ..	,, ,, *pañch.*
Sixteen ..	,, ,, *sho* ..	,, ,, *chhē.*
Seventeen ..	,, ,, *afta* ..	,, ,, *sāt.*
Eighteen ..	,, ,, *oitto* ..	,, ,, *āth.*
Nineteen ..	,, ,, *desh sorebut yēk* ..	,, ,, *das kam ék.*
Twenty ..	*Bis, dooi deshaw* ..	*Bis, do das.*

[1] Borrow says that few of the English Gypsies are acquainted with this word—consequently when they wish to express the number seven without being understood by outsiders, they say *duo trins ta yeck*, which in Hindustani would be *do tin aur ēk.*

11. Account of an Expedition among the Abors in 1853.

By Rev. Fr. Krick (*of the Foreign Missions of Paris and Superior of the South Tibetan Mission*).

Translated by the Rev. A. Gille, S.J.

[Fr. Nicholas Michael Krick, born at Lixheim (France) in 1819, came out to India in 1850. From Gauhati, where he made a short stay, this plucky missionary set out alone, with his cross, his flute, his sextant and his medicine-box, on his way to Tibet. Following the Brahmaputra and a portion of the Lohit, he soon reached Saïkwah; thence, crossing the territory of the Mishmis, he succeeded in passing the Tibetan frontier and settled in the village of "*Sommeu*" or Samey. But his success was short-lived: after three weeks the Yong forced him to quit the country. He returned to Saïkwa, determined to wait for a more favourable opportunity. Meanwhile he visited the Abors in 1853. In January of the following year, Fr. Krick started again northward, in company with Fr. Bourry, and after a seven months' journey, reached Samey a second time. Things were getting on satisfactorily, when the two intrepid missionaries were ruthlessly massacred by Kaïssa, a Mishmi chief. The murderer was captured by Captain Dalton, conveyed to Calcutta, and there tried and executed. (Cfr. Adrien Launay, *Histoire de la Mission du Thibet*, I. pp. 98-200.)

The book containing Fr. Krick's own spirited record of his first expedition to Tibet, and his stay among the Abors, is now getting scarce; moreover, our recent dealings with this tribe will impart additional interest to his account of their manners and customs.

The following is the title-page of the book:

> Relation d'un Voyage au Thibet en 1852/et d'un voyage chez les Abors en 1853 Par M. l'abbé Krick/De la Société des Missions Ètrangères, Supérieur de la Mission du Thibet pour le Sud; suivie de quelques documents sur la même mission Par MM. Renou et Latry./ Paris/A la librairie de Piété et d'Education/ d'Auguste Vaton 50 Rue du Bac 1854./

Fr. Krick's relation on the Abors goes from p. 169 to p. 201.—A. G.]

Chapter I.

Journey among the Abors.—Difficulties to know their country.—Vain attempts of the English to penetrate into it.—Ceremonies attending my reception.—General assembly at my arrival.—Superstitious notions of the people about the origin of sickness.—My reputation as a doctor.—Suspicions entertained against the doctor and missionary from Europe.—Description of a fire.—Superstitious practices to extinguish it and drive away the fire-spirit.—Other accidents happening in the village attributed to my presence.—My expulsion decided.—Departure.—The village of Mimbo.

Dear Sir,[1]

I sent to Mr. Foucaud[2] the journal of my expedition to
p. 170. Thibet; to-day I send you the account of a shorter and less dangerous journey among the Abors or Padams.

As no European has ever gained admittance into this country, it is difficult to have an idea of its geographical features. Then, as you know, it would require long and familiar intercourse with a people, to give anything like an accurate description of its customs. Nothing short of mastering its language and living its home-life would qualify one for such a task.

This remark is never so true as when a traveller is called upon to describe a savage tribe such as the Padams; they are unfamiliar with the first rudiments of the most ordinary knowledge, they possess no written language, and profess the strictest abstention from all intercourse with strangers. I am therefore hardly qualified to speak of the Abors with authority, though I am the only foreigner who has stayed among them for some considerable time

Since the English first occupied Assam 29 years ago, several agents of the East India Company have tried to gain access into this country, with a view, if possible, to enter into commercial relation with Thibet, and to ascertain whether the Siang, known to the English by the name of Dihong, is really
p. 171. the famous Zang-po, which crosses Thibet from East to West, and which has been such a puzzle to the geographers of the last centuries. But the Padams knew the "Timeo Danaos et dona ferentes" "If we allow," so they said, "any English-"man to penetrate into our country under what pretext soever, "he is sure to have an army at his heels."

In their opinion, any white skin, any nose somewhat protruding is of English make. This will make you understand the trouble I had in getting their consent to receive me. My

[1] This account was sent to Dr. Bousquet, surgeon at the Necker Hospital, Paris, under whom Fr. Krick had taken some lessons in medicine.

[2] Professor of Tibetan.

cross so similar to theirs and my reputation of a French priest were my only passport. My reception was accompanied with ceremonies peculiar enough to find place in this letter.

Eighteen young men met me at the foot of the mountain. No sooner did I move on, than the two youngest of the band proceeded to cover my body with leaves, whilst singing words utterly unintelligible to me. They meant of course to purify me and deliver my body from all diabolical influence. This exorcism was soon to be followed by a second performance more weird and threatening. As I emerged from the forest, I was made to pass under an arch bristling with bows and arrows, and decora- p. 172.
ted with all sorts of devilries and monsters pierced with arrows, and in striking attitudes that baffle description. This piece of architecture was fearful to behold, as well it might be, for it was to expel from my body the more stubborn devils who had been daring enough to cross the first obstacle. The women rushed to their doors to watch me passing by, and it was amidst a throng of curious on-lookers, squalling children and howling dogs that I was conducted to the common building, where I found the men waiting for me. My arrival was hailed with a thunder of savage and dinning cheers sounding through the house like a discharge of artillery. It was a last assault on the evil demons who should have forced their way through the first barricades; the most vicious devils would retreat before such a terrific uproar. The spirits being thus settled to everybody's satisfaction, I had now to lend myself to the curiosity of the crowd.

In an instant, I was surrounded by a circle of eager men and women, studying every detail of my figure. I was repeated- p. 173.
ly obliged to go out into the street to show myself to the public. Lorrain, with his long shaggy hair, his tail drooping low, and his flabby ears, went in for a fair share of the public admiration. The crowd kept watch the whole night; fleas were no less anxious to get to my skin; with so many guests, sleep of course could not be very long.

Next day, general meeting, to which the whole village was convoked. The six chiefs sat down in a circle, right in the centre of a spacious hall. The president of this uncouth senate invited me to come and sit at his right, and without previous warning donned my head with a reed helmet of monstrous size, crowned with a red painted tuft of goat's hair, and another of bear's fur, two bear's tusks crossing each other on my forehead. This was the signal that opened the meeting. After several speeches, the members were asked to cast their votes; the chiefs then withdrew for deliberation, soon returning with a favourable answer. "Migom (king)," so they said, "we are "convinced that your intentions are peaceful: we therefore "allow you to advance through our country."

But as I was expecting the arrival of a new confrère, who p. 174.

was to accompany me, I demanded permission to wait for him. "Yes, yes," they all replied with one voice, "and if you cure our sick, we shall keep you for ever, and we shall build you a house," and in evidence of their sincerity, the chiefs put the guard-house at my disposal.

No sooner was I settled down in my new home, than invitations poured in from all sides requesting me to go and look after the sick: being a priest, I must needs be a physician too. The only remedy these people ever heard of is religion. They have recourse to neither drugs nor medical treatment of any kind; even the use of simples is unknown. Such things are according to them perfectly useless, as all diseases, both internal and external, are directly caused by either bad spirits, or good spirits having some good reasons to show their dissatisfaction. Exorcism is therefore the only remedy, and the only doctor is the priest: the bad spirit must be expelled, or the good one propitiated by sacrifices. If the complaint is proof against these superstitious practices, it is because the spirit is unrivalled in malice and power: there lies the secret of all mortal diseases. As I am writing to you, my room exhibits the appearance of a hospital of incurables: here is a young
p. 175. woman whose arm is covered with a horrible ulcer. "When "did you get that?" "Three years ago," she replied. "I "killed a rat; my disease dates from that time."

Further on there lies a young man suffering from scrofula: his legs are swollen, his body is covered with ulcers,—a dying skeleton. "How long have you been ill?"—"Migom. I used "to be nice and fat, a stout and brave warrior; but last year the "evil spirit got hold of me, and he has done his work." Another patient has his stomach swollen to awful dimensions. I see nothing but suffering all about me. All these patients are somewhat trying to my medical skill; they are draining my dispensary, whose deficiency beats that of my capacity. However it was God's will that several patients should recover perfect health; hence there was a rush for the French Hippocrates. Everybody wanted to fall sick for the sole pleasure of being looked after by such a learned man. It was no good my
p. 176. pretending to be unable to cure certain diseases; if I did not cure them, it was because I did not want to;—willy-nilly, I had to give them remedies, were it but a few drops of water. A few purgatives, some ointments, a little care, had worked all these marvels. Such was the enthusiasm that those people wanted to carry me in triumph on their shoulders. It was no use for me to tell them that Almighty God had given to my remedies the virtue that cures, they would not believe me. My power was in the touch of my hand. And so they went on repeating: "You are the most powerful Dondai (priest); no "spirit can resist you; your hand cures everything." Of all this the practical consequence was that I had to touch every

thing with my hand, even the most disgusting wounds. I was not given a minute's rest. At every moment some one came rushing to me: "Father, some medicine! Come quick!" At early dawn I went out to see my patients only to return at midday thoroughly fagged.

However, my great reputation was very near causing my ruin. One evening, I was startled by loud clamours issuing p. 177. from the common house. The next morning, the president came to inform me of what had happened. "Migom," he said, "some Meris (an Assamese tribe subject to the English) "have spread the rumour that you are an English spy; that "you should not be trusted, as you possess the power, so they "say, of turning our food into poison by a single act of your "will. If we keep you any longer, our country will suffer "great calamities. Last night our people insisted on setting "fire to your house, but they refrained from carrying out their "design on my promising them to force you to leave the "country." There was no time for deliberation; so my departure was fixed for the next day.

Towards ten o'clock in the evening, another chief came to me at the head of a party of men, who evidently objected to the loss of my medical powers. The chief then spoke:— "Migom, we have at last made those cowards understand the "folly of their behaviour, and that, instead of expelling you, "we ought to keep you to look after our sick. Besides, are "you not our father? Did you not, at an early period, bring p. 178. "us the blessing of the cross? And now, after having been "round the world, you have been restored to us. When you "will have mastered our tongue, who knows what new benefits "you will have to bestow on us? Therefore stay, it is the "wish of the whole village."

But the devil, who has no worse enemy than the missionary, was not to be so easily beaten. Two days later, whilst the villagers were away working in the fields, the village took fire. On hastening to the spot, what was my surprise to see standing on the top of each roof one or two men brandishing long swords, and endeavouring to kill the fire-demon. "Fetch water," I shouted; but, they were obviously too busy with their quixotic performance against the devil to hear me; so I told off the women, who were quietly admiring the valiance of their husbands, and forced them to fetch water; and as they saw what the water could do, they all rushed back to the torrent. Even our Don Quixotes, seeing that their sabres were not half as effective as water, soon exchanged their weapons for the water-jars. All the houses, save two, were rescued from destruction. I was proclaimed the hero of the day: all p. 179 acknowledged that the demon of fire dreads the water, though some felt inclined to blame me for not having foreseen and prevented the accident.

The next thing to do was to imprison the spirit of fire on the scene of the disaster. The burnt houses were hedged in and surrounded with devil-scaring emblems. In spite of these precautions, it was feared that the devil might escape and take refuge into some odd corner of the village, so the very next day all the men, armed to the teeth, with beating of drums, and fearful howls, set out in pursuit of the devil, far into the jungle.

The two families whose dwellings had been burnt down, were banished for one year, for if any of their members were to set foot in a house within those twelve months, the building would not escape from the flames.

Useless to add that my presence was made responsible for all those accidents. The loss of two mitous (wild cows) sustained by my next neighbours increased the public distrust. Great, however, was the embarrassment of those poor people ;
p. 180. on the one hand, they had found in me a friend, ready to do anything to bring relief to their bodily as well as to their spiritual ills ; on the other hand, fright chilled their attachment to me. The diplomats of the village could not bear to see me settling so close to Assam ; as for me, I delayed my departure as much as I could, as I was anxious to give to my confrère, Mr. Bourry, sufficient time to join me.

Eventually, on Good Friday, whilst all the huntsmen were gathered at my house for a hunting-meet, Lendemk, the great chief, said to me :—"I order you to leave the village to-"morrow."—"All right," I said. "I had come to give you "my affection, and to offer you my services, but as you refuse "my benefits, I will carry them elsewhere."—"Oh ! I don't "mean that," he exclaimed; "you misunderstand my words. "Stay for some few days more, but if any accident were to "happen, I should be made responsible for it."—"That is just "the reason that induces me to go," I answered. "The very "first accident that happens in the village, you will attribute it "to me."

All I could do was to secure the assistance of the president of the Council in finding out a direct route into Thibet
p. 181. during the next season. The following day, before leaving, I visited the sick once more, dressed their wounds and at once set out on my journey with Ibang, the second chief, as my guide. My heart was heavy, though it was a considerable relief to shake off at last the innumerable hosts of fleas that devoured me. We pitched our tent in the forest for the night. The next morning a violent storm burst over our heads. I took the altitude of the sun ; I registered on the 11th March 1853, 115° 44′. As I had not the declination of that day, I could not make the calculations. The longitude was about 95° 20′ (Greenwich).

Then I cast a long parting glance towards the village of Mimbo which I was so sorry to leave.

The village was situated at a height of 600 ft. above the plains of Assam, and spread out on the curved flanks of a magnificent mountain, that was encircled by a belt of peaks rising to a prodigious height. To the west rose the sacred Orega peak, the rendezvous of all the spirits of the country. The small river Sikan flows from East to West along the foot of the mountain. Towards the South, the eye rests on the smooth plains of Assam, where the famous Siong or Dihong p. 182. of the Assamese shoots up, reflecting the rays of the sun across the sky.

Now a few words on the race to which the Padams belong and on the marvellous signs which I have discovered among them.

Chapter II.

To what race do the Padams belong ?—Their origin as told by p. 183. *themselves.—The four kinds of crosses worn by this people.—Their opinion on the meaning and origin of this symbol.—Conjectures on the subject.—Costumes.—Ornaments.—Weapons.—Government. —Soldiers.—Cultivation.—Architecture.—Trade.—Manners.— Hospitality.—Religion.—Their extreme superstitiousness.—Penances to appease the demons.—Character of the Padam.—Some words of his language.*

The Padams stand midway between the Mongolian and the Caucasian races. They are beardless; hair and eyes are black; the skin is brown; the eyes stand at right angles with the nose. The forehead is flat, the face broad, the nose short, the cheek-bones somewhat prominent, and stature moderate.

This is how they account for their origin: "When the "earth was but a mass of mud, God came down from Heaven; "with a handful of mud he made two brothers and two sisters. p. 184. "The Padams descend from the elder, and the Miris from the "younger brother Hence the Padams are a privileged race, "living in plenty and invincible on the battle-field."

The males are tattooed at the age of eighteen; the pattern is, in my opinion, of evidently Christian origin.[1] The majority wear on the forehead a perfectly shaped Maltese cross of bluish

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1 We venture to suggest that in this explanation of Abor tattoo-marks Fr. Krick was unduly influenced by his zeal as a missionary. There is, we believe, no reason to attempt the derivation of these symbols from Christian sources, as the cross one of the simplest designs imaginable—is found in some form or another in all savage ornamentation. The designs found nowadays tattooed on Abor men or women are far more varied in character than Fr. Krick's observation would lead one to suppose, and all will be found fully detailed in Sir George Dunbar's forthcoming memoir on the anthropology of the Abors and Galongs.—*J. Coggin-Brown* and *S. W. Kemp.*

colour ✠; others wear the ordinary cross ✝ with the vertical beam running along the nose, and the cross-bar above the eyes. Others wear the Lorraine-cross ✞, with the upper cross-beam on the forehead, and the lower lying across the bridge of the nose. Others again wear the Maltese cross on their calves. The women have the Maltese cross tattooed on the upper lip, and on their legs the Lorraine-cross with two St. Andrew's crosses drawn on either side, as shown in figure

XX✞XX

The men have as a rule their chin tattooed with three vertical and parallel lines: the women have five or seven of them, as the case may be, on the chin, and four on the upper lip, two on either side of a cross, and the whole set is bracketed.

p. 185.

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I have often questioned the Padams as to the origin and meaning of these signs. Some answered that God at creation had given them to the Padams as a distinctive mark of the elder tribe; others asserted that they had received them from a northern tribe; several confessed their ignorance in the matter, but all agreed as to its being the sign of God, and a most beneficial badge too, as "he who wears it," so they said, "is acknowledged and protected by God; if he dies, he is at "once received into heaven." "But what, if he has not the "sign?" I asked; "Where is he to go?"—"God will disown "him and cast him off."[1]

[1] In a letter, dated Saikwock, 1st December, 1851, Fr. Krick thus describes his first interview with the Abors:—

On the 26th September I landed at Saikwock, situated along the eastern bank of the Brahmapootra. Captain Smith, commander of the frontier troops, received me very kindly.

On the 19th November, Captain Wath, who was organising an expedition for the protection of the Dihong gold-washers, invited me to join him, and offered to introduce me to the Abors. We started with an escort of 200 soldiers and 9 elephants. After a five or six days' march, we met about 600 Abors all armed with bows and arrows, and lances measuring some fifteen feet in length. Captain Wath, after a friendly talk, asked them to receive me and see me safe to Tibet. "We can't do that," they replied; "he would come to grief,—and we are responsible for our guests."

What struck me most during this conference was, besides their savage dress, the typically European physiognomy of those people.

But I soon noticed, at a closer examination, most extraordinary tattoo marks: it was a cross neatly designed and painted in blue on their faces. Most of them wore it on the forehead, others on the nose; some of these crosses had a double horizontal beam, the vertical line running

I may be allowed to hazard here a suggestion with regard to the origin of these signs. It is my opinion, and all those who have come in contact with the Padams agree with me, that the pattern, as I have described it, is the Christian cross. These are briefly my reasons:

1st. No other marks are tattooed on their bodies./
2nd. Their crosses are altogether similar in shape to p. 186.
our four crosses: the ordinary cross, the Maltese, the St. Andrew's and the Lorraine crosses.
3rd. The spiritual meaning attached to them by the natives strongly confirms my conjecture.

What then would be the meaning of the vertical lines, always numbering 3, 5 or 7, with which they tattoo their chins? Might not the number 3 be a reminiscence of the Blessed Trinity, the number 5 a reminder of the five wounds of Our Lord, and the number 7 a figure of the seven Sacraments? Whereas the four lines on the upper lip might with some plausibility represent some virtues or mysteries.

But when were these emblems adopted by the Padams? Fr. Athanasius Kircher in his in-folio bearing the title "La Chine illustrée" mentions several missions established in Thibet, China and Tartary from the time of the Apostle St. Thomas. This book was printed at Amsterdam in 1665. He also published a map, roughly drawn, but giving accurately enough the chief towns and districts: on it he traced the route followed by Frs. Francis [1] Dorville and John Grabère [2] from Peking to Goa,[3] through China, Tartary, Thibet and Bengal. p. 187. These Fathers travelled from Lassa to the North of the Padam country, whilst according to their information Fr. Andrada went as far as the Thibetan town Radoc. Now we are told that in this country they discovered evident traces of the Christian religion, proving to a certainty that the Gospel had been preached to those tribes. They speak of three men who bore the names of Dominic, Francis and Anthony.[4]

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from the forehead down to the tip of the nose; others had only one single cross-beam running either across the nose or above the eyes.

The savages were unable to explain the origin of this symbol; but they believe that any man who is marked with this sign, is protected in this life, and taken straight to heaven in the next, and that none but these are called to share God's felicity.

I made them understand I was a priest, a teacher of prayer, and that I had come to explain to them the mysterious power of the cross. I then took my crucifix, kissed it, and let them kiss it each in turn..... Cf. *Annales de la Propag. de la Foi*, 1852 (1853 ?).

[1] His Christian name was Albert.

[2] To be spelt: Grüber or Grueber.

[3] Not Goa, but Agra.

[4] Neither Father A. de Andrade nor Fathers Dorville and Grueber had anything to do with the Abors. Their journey lay hundreds of miles

In 1826 Colonel R. Wilcox, on discovering the use of the cross among the Padams, made attempts to trace its origin, and found in Hindostan a map on which it was stated that since the twelfth century there existed a mission in the South of Thibet among a tribe called Shokhaptra.[1]

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away from Assam. The three native Christians mentioned by Grueber in Kircher's *China illustrata* (Amsterdam, 1667, not 1665) must have been met in Oudh or Bihar, in one or other of which provinces Mīrzā Zū l-Qarnīn, an Armenian Catholic, was governor between about 1627 and 1633, Fr. Joseph de Castro acting as his chaplain. As for St. Thomas, it is quite true that Father H. Roth, S.J. (Cf. Kircher's *China illustrata*, Amstelodami, 1667, p. 91, col. 2) states that St. Thomas preached in Bengal and China, his information resting on a Latin translation of a Syriac text of the Acts of the Saint, which he procured from Malabar (Cf. also TRIGAULT'S *De Christiana Expeditione apud Sinas*, lib. i, cxi; YULE, *Cathay*, I, p. lxxxix); but, even though these Acts mention "Cabul" as one of the spheres of the Saint's activity, what authority can we attach to them in the case of Bengal? The earliest Christian Missionaries who passed through Assam seem to be Fathers John Cabral, Stephen Cacella and Manoel Dias, S.J. (1627—32). They went through Kuch Bihar into Tibet; but, what with continually travelling from one place to another, studying the languages and the early death of Dias (1629) and Cacella (1630), their apostolate cannot have left any serious impression on the countries they visited. Our next information about Christians in Assam belongs to the years 1661-63, when a large number of Portuguese, English, Dutch and Armenian adventurers helped Mir Jumla in his conquest of Assam. This remarkable and little known episode is related very spiritedly in *Relation du Naufrage d'un Vaisseau Hollandois, Nommé Ter Schelling* (my copy is a fragment of a collection, pp. vi+131-276), pp. 250 *sqq.* The treasures found by Mir Jumla in the tombs of the Kings of Assam were prodigious. Mir Jumla himself carried away as his share 4 millions. Many of the Portuguese and *Topas* (half-castes) settled at Rangamati, a Moghul outpost, identical I believe with Rangamatighāṭ, in the Darrang District. Bishop F. Laynez, S.J., and Father Barbier, S.J., visited them there in 1713-14. (Cf. my notes on Father Barbier's letter in *Bengal: Past and Present*, 1910, p. 22, s. v. Rangamati.) Two Catholic churches existed there or in the neighbourhood before 1696, the Christians being the descendants of Portuguese and other adventurers from Chittagong, Siripur, Firingibazar (?), Dacca, etc. Even the existence of this Christian community could not, I think, be appealed to in order to explain the use of crosses among the Abors. The distance is still too great between Rangamati and the Abor country. The apparition of crosses among the Abors belongs to a number of similar instances, ranging over countries very far apart, and the explanation of which is extremely complex. As suggested by Messrs. J. Coggin-Brown and S. W. Kemp, the use of crosses as tattoo-marks may have not the slightest connexion with Christianity; on the other hand, it is not impossible that the Abors should have borrowed the sign from the Tibetans. And it becomes more and more recognized that the sign of the cross—not the *svastika*—found among the Chinese and the Tibetans is due to the influence of Nestorianism, an influence all too little acknowledged heretofore. I refer the reader to the *Variétés Sinologigues No.* 3. L. GAILLARD, S.J., *Croix et Swastika en Chine*, Edn., Changhai, Imprimerie de la Mission Catholique, 1904, pp. 154-155, where Fr. Krick's observations are mentiond.—H. HOSTEN, S.J.

[1] [Everyone interested in early Christianity in India would like to know whence Father Krick took this information? Is anything known about the date and authorship of that map or again about any of Wilcox',

Now, I have entered Thibet by the South-Eastern frontier, without coming across any traces of our holy religion ; several other travellers entered it by the South-West with no greater success. So, it is quite possible that the Shokhaptras be a tribe occupying the South of Thibet, in the vicinity of the Padam country. As a matter of fact, I have often been told by the Padams that there existed towards the North, before reaching Thibet, a tribe which shunned all intercourse with the Padams, and from which they pretended to have received the p. 188. cross. The Padams, being their next neighbours, must have been struck by the importance those people attached to the cross, and may have adopted it for their own use without guessing much of its meaning. Or it may be that the missionary, in order to bring home to those uncultured minds and hearts the truths of our faith, advised his catechumens to tattoo themselves with the cross ; or anticipating, perhaps, that the missionary's death would leave them without a pastor, the natives may have wished in this manner to preserve a precious deposit of their faith.

I once met a Thibetan who was marked with the same sign ; on my asking where he had learned to wear it, he pointed towards the Padam country, adding that he had received it from the savage mountaineers.

The dress, government and customs will not be devoid of interest for a Frenchman ; so a few details on that subject will, I expect, be welcome. I have very little to say about their mode of dressing, as their clothing is reduced to a minimum somewhat too primitive ; however, the full dress sometimes p. 189. worn by men deserves a short notice.

It is composed of eleven pieces : 1st, a loin cloth ; 2nd, a long loose mantle open in front, and sprinkled all over with designs of shining colours such as stars, etc. ; 3rd, a cuirass painted black and made of camel hair ; it covers the chest and the back, the head passing through a hole in the centre, and is used as a defensive covering against the thrust of the lance ; 4th, a steel helmet painted black, with a tuft of bear's or goat's hair on top ; two boar-tusks cross each other in front, like the two guns on the shako of an artillery-man. The three last articles are imported from Thibet. 5th, an edge-tool bearing a common resemblance to the hatchet and the sword [1] ; 6th, a long Thibetan sword ; 7th, a small basket ; 8th, a bamboo shield, turned

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writings ? And can the Shokhaptras be identified ? Fr. A. Desgodins, the Tibetan Missionary, speaking of a lama who had travelled all over Tibet, says : " He followed again the lower part of the Tsangpo as far as a savage tribe called by the Tibetans Lhopa (inhabitants of the South) or Lho-kha-tchra (tatooed inhabitants of the South)." From the lama's report Fr. Desgodins did not hesitate to conclude that the " Lokhaptras " were the Abors *Proc. A.S.B.*, 1880, p. 201.—H. Hosten, S.J.]

[1] Possibly the Nepalese kukri.—[A. G.]

into an umbrella when it rains; 9th, bow and arrows; 10th, a
p 190. long knife; 11th, a pouch containing tobacco, a pipe, a flint-stone and similar articles.

Neither women nor men are fond of long hair; they do not allow it to grow beyond 2 or 3 inches in length.

The women wear heavy yellow necklaces, iron or copper bracelets; but the most peculiar article of their ornamental apparel is their ear-rings;—these are long spirals of wire about two inches thick, sufficiently heavy to tear the ears, and stretch them out of shape, so that the ornaments dangle on the shoulders. The men wear but one kind of necklace; it is composed of blue stones strung together, of unusually neat cut. This article is highly valued, and transmitted from father to son, as they pretend to have received it directly from God. Some stick into their ears silver or wooden (bamboo) tubes.[1]

The Padams are not a nomadic people, but possess large and fine villages. Their system of government is democratic and republican, the strictest dependence being tempered by
p.19 1. the most absolute freedom. Every man is his own master. But, if a question of common interest arises, the point at issue is settled by a council, under the presidency of the chiefs of Bor-abor, this village owing its privilege to the fact that God placed in it the elder of the two brothers he created

Excepting the case just mentioned, each village is self-governing and independent. It has its own administration, both legislative and executive. Women have no share in the government; they cannot even set foot in the council-room.

Every male, reaching the age of reason, is by right active member of any assembly. Each commune is ruled by five or six chiefs elected for life by the people; they control all affairs of greater importance. If any of them dies, his son, if capable, succeeds to his office; else, he remains a common citizen, and another election supplies the vacancy.

Laws are framed by the people, sanctioned by the council, and promulgated by the president. Every decision is supposed
p. 192. to come from the people; the chiefs have no right but to approve and enforce it. Hence, the people proposes, the council sanctions, and the president promulgates.

Every evening, all the men gather in the spacious council-room to discuss the topics of the day, which means: (1) to inform one another of what has been seen or heard; (2) to discuss the political questions put forth by one of the chiefs; (3) to settle what the village will do on the next day, for it is understood that no one is free to dispose of his time as he

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[1] T. C. Hodson in *The Naga Tribes of Manipur*, p. 32, describes a similar ornament worn by the Nagas. "Brass cylindrical ornaments are often inserted (into the pierced lobes) and the young men appreciate the advantage of an empty cartridge case as a personal decoration." This will make Fr. Krick's meaning more intelligible.—[A. G.]

thinks fit ; his daily work is cut out, discussed and officially decreed by the majority of the council. Hence, every evening, between 10 and 11 o'clock, boys are sent about the village shouting at the top of their voices : "To-morrow, tiger hunt ! "To-morrow fishing ! To-morrow, field labour ! To-morrow, "genna, *i.e.* obligatory holiday !"

These injunctions are obeyed to the letter, for this people p. 193.
is as law-abiding and respectful to the powers that be, as it is proud of its liberty. To call a Padam a slave is an insult that would make this proud mountaineer gnash his teeth and grasp at his bow.

The council-house is also used for extraordinary gatherings convoked to deal with a sudden emergency, such as was my arrival; sometimes, especially on rainy days, it is turned into a rendezvous of gossip and handiwork. Everybody takes his tools and passes the time as pleasantly and as usefully as he can.

The tribe has its army or civic guard, composed of young men above 17 or 18. All of them, except the married men, sleep at the barracks.

The Padams are hunters by taste, and farmers by necessity ; yet, they are excellent cultivators. The roads are planted on both sides with fruit-trees. The only farming-tools they know are their arms and their hands, and their backs are their only means of transport. Yet their granaries are well stored with rice, gums, maize, bobossa and several other products.

The bow is their favourite weapon, and they use it with great dexterity. It is their vade-mecum, the first toy of the p. 194.
child, who shoots from morning till night.

Arts and trades are scarcely known. The women weave their cotton with rough yarn by means of an appliance which no man in his senses would ever think of calling a loom. The worker in iron can be called neither a blacksmith nor a farrier : his anvil is a stone, a bamboo stem serves as a substitute for the bellows, and the work is as wretched as the tools. Architecture has not had much of a chance. Planks planed with a hatchet compose the flooring and walls of the Padam hut, and the roof is thatched with plantain-tree leaves. The inside is so dark that it requires some caution to feel one's way in it. But if their dwellings are roughly built, their bridges deserve our admiration. Their construction is solid ; the floor is a light network of rattan palm twigs, and so elastic that it yields to the pressure of the foot and rises like a spring.

Commerce is insignificant. The following are the domestic p. 195.
animals : 1st, the mitou or wild cow, domesticated and exclusively reared for the slaughterhouse ; 2nd, small black pigs, much appreciated by the Padams ; 3rd, fowls ; 4th, dogs, small and lean, but excellent hunters.

Rice and herbs form their staple food ; they are eaten without either salt or butter. Meat and fish are the most

popular dishes. The ordinary drink is fermented rice beer or bobossa water ; pure water is never used at meals.

The Padams are naturally hospitable; the guest is first expected to give a present to make friends with his host, but it is the meal that sanctions and seals friendship for ever; as soon as you have touched food, "you are friends till the sun falls," as these savages are wont to say.

Respect for old age is pushed to its extreme limits, and surpasses whatever has been recorded of old Lacedæmon. Old people are exempt from all work, and constitute a separate class by themselves. Whilst the young are out in the fields,
p. 196. the old gather in the council house and make merry. No calamity is dreaded as much as the curse of an old man. One day, as I called on the chief Leudouck, I saw an old man whom the chief had called in to the sick-bed of his child. I asked him whether he was a priest. "No," said the chief, "but the words of an old man are a powerful blessing ; God endows it with a divine efficacy." Old age is, as you see, a most desirable condition among the Padams ; all honours are due to it, and priests are taken exclusively from its ranks.

On my travels I have come across many superstitious people, but really the Padams beat them all. Here everything is done, everything explained by invisible agencies. Their spirits number millions. Each forest, each tree of unusual size, water, chiefly when it eddies round or murmurs in its fall, mountains and villages, are all crowded with divinities good and bad, great and small, weak and powerful. They are held in such fear that nothing could induce a Padam to violate what he considers to be a manifestation of the god's will. If
p. 197 a stone rolls from the mountain, if a leaf drops from a tree, it must be a spirit on a stroll ; if the wind blows through the forest, the gods are indulging some healthy exercise; if the wind shakes the trees and howls through the valley, the *deos* or spirits are quarrelling.

The priest makes it his constant business to appease the wrath of the good spirits and to fight it out with the bad ones.

The soul survives the body and is in its future life rewarded for its virtues and punished for its crimes. Priests and priestesses alone have the power to sacrifice to the gods and enter into communication with them. It is God who chooses the priests from all classes and gives them their mission. The wonders a man works, the events he predicts, are so many signs of his vocation to the priesthood.

The priest expels the spirits and forces them to restore the soul to the dying man. This is how this extraordinary feat is performed :—

Amidst a crowd of singing and howling attendants all standing around the patient, the officiating priest, armed with a

long sword, performs a wild dance. Without ceasing to whirl rapidly round, he throws in the air a handful of rice, the grains p. 198.
of which go in search of the soul of the patient. As the grains drop on the blade of his sword, this skilful performer catches the soul in its flight, proudly shows it to the onlookers, fastened on the point of his sword in the shape of an unfledged bird, and runs to tie it on the top of the patient's head. If the soul returns to the body, the patient will not die; but he would be hopelessly lost, should the bird succeed in freeing itself and fly away on its miraculously acquired wings and feathers.

My informants were sorely disappointed at my incredulity, and swore that every single word of theirs was the truth pure and simple. "We have often witnessed the facts as we "describe them," so they said, "and we can't understand how, "being a priest, you can doubt them, as they are in every "priest's power. The first time a man will fall sick in the "village, we shall take you to him, and you will see the "truth for yourself."

What appears more certain and more tangible are the penances and privations these people are ready to undergo to propitiate or appease the spirits. They unhesitatingly suffer p. 199.
any mortification and trial, except that of visiting the sick; for to see a sick man, or to have anything to do with him would be running into the jaws of a bad spirit.

When I was staying at Mimbo, the villagers went out cutting rattan twigs for the construction of a bridge; before commencing the work, they sacrificed a dog to the spirit of the mountain, so that he should have no leisure for mischief, whilst he was feasting on this delicacy.

The bridge was placed under the protection of a good spirit who received sacrifices to his heart's content. To give proof of still greater generosity, the whole village made genna,[1] *i.e.*, took a three days' holiday in honour of the spirits. A three days' genna is also observed after a burial, a two days' genna for a still-born child, and one day for a dog dying a peaceful and natural death, as the dog is a victim in odour of sanctity with the *deos*. At the birth of a child, the whole family is impure for a number of days varying according to the sex of the child.

Adults do not marry before the age of 18, though it may p. 200.
happen that a younger bride be received into the bridegroom's family and treated as a daughter of the house. For the first five or six years of her marriage life, the wife continues to

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[1] According to T. C. Hodson (*The Naga Tribes of Manipur*, p. 164), *genna* among the Naga tribes means anything forbidden or prohibited. It is likely that, among the Abors, genna is but a taboo upon work.—[A. G.]

stay with her parents, unless she begets children in the meantime and is thus entitled to set up a separate household. Should the parents disapprove of the alliance, the girl may leave them and marry lawfully without their consent.

The Padam is very active, jolly, a lover of freedom and independence, generous, noble-hearted, plain-spoken, more honest than the average Oriental, not over-moderate in eating and drinking, at least as far as quantity is concerned. I have not lived long enough among them to be able to speak of their morality. I confess I have never been able to discover what they understand by modesty; they seem to possess much of the child's simplicity, and Mimbo is undoubtedly less corrupt than Paris. Dancing is the bodily exercise these people love most.

p. 201. I herewith join a short glossary as a specimen of their language.

Man	..	Ammie.	I (nominative case)	..	Gno.
Woman	..	Mimeu.	Me (genitive case)	..	Gnok.
Male	..	Milbong.	,, (accusative case)	..	Gnom.
Female	..	Neng-eu.	You (sing., nom. case)	..	No
Young man	..	Jame.	,, (genitive case)	..	Nok.
Girl	..	Mimmoo me	,, (accusative case)	..	Nom.
Old man	..	Midjing.	He (nomin. case)	..	Bu.
Old woman	..	Eudjo.	,, (genitive case)	..	Buk.
Friend	..	Sangue.	,, (accusat. case)	..	Bum.
Wood	..	Isching.	We ..	..	Gnoloa.
Water	..	Assi.	You ..	..	Noloo.
Boiled rice	..	Amu.	They ..	..	Booloo.
Fire	..	Umeu.	Sun ..	..	Domie.
House	..	Eukoumeu.	Moon ..	..	Palo.

I love you	..	Nom aiang.
Why do you fear ?	..	Kapilla pussoie ?
Come quick	..	Soallabangmenu.
Go away	..	Guigueto.
Don't fear	..	Peussu menpeka.
I am hungry	..	Kenodak.
Give me some meat	..	Adine bi.
What is your name ?	..	Nok amine eukoa ?

12. A Note on Buddhism.

[Read before the Society on 30th January, 1913.]

By Prof. Dr. H. Oldenberg.

Among the pleasures which the European Indologist enjoys when visiting this country, it is not the least to come into personal contact with the Asiatic Society of Bengal—that Society which long ago laid the foundations for our knowledge of Indian literature and languages, and which still continues to promote Indian studies with undiminished vigour. To me personally it is a source of quite a special satisfaction to become acquainted with this place. You have permitted me, in a manner that I feel as a high honour, to count myself as one of your own. The idea of the Society which I carried in my mind now is replaced by vivid intuition, and my connexion with the Society thus acquires a deeper, more real meaning for me.

It would be a source of high gratification to me if, on this occasion of meeting you, I were in a position to place before you some new results of labours of mine, and to consider together with you how these results connect themselves with what was previously known on the subject. But to my regret I am not prepared to do so. I have come to India not with the full literary apparatus which would be required for an attempt of the kind, but only with the light equipment of the tourist. I therefore crave your indulgence if I am unable to place before you any detailed account of recent investigations. I must request you, instead, to give your attention to some considerations of a different kind. During the past year I have occupied myself with various investigations bearing on Buddhistic literature. This has recalled to my mind old times—it now is thirty years ago that I made the first attempt to solve some of the problems which Buddhistic literature presents. And I now feel tempted to place before you a sketch drawn in rough outline, illustrating Buddhistic research—or some points of it—as it has developed during the course of the last decennia, and indicating my own views regarding some of the leading problems. If in some places this sketch should lack that clearness and definition of outline which I would willingly impart to it, I must ask for your indulgence; in travelling one cannot work quite in the same way as one works, or at any rate ought to work, in one's quiet study.

When thirty years ago I first entered the arena of Buddhistic research, I saw myself surrounded by the turmoil of the

battle that was then being fought regarding the relative position and value of what at the time was called Northern and Southern Buddhistic literature. On one side there was the wonderful treasure for which scholarship was indebted to Brian Houghton Hodgson—the store of manuscripts, in Sanskrit and the so-called Gatha dialect, which had been brought from Nepal, to which there had to be joined all the matter derived from Tibetan and Chinese sources. On the other side there was the literature which came from Ceylon and Burma—the literature of the Pali texts. Not over-much was known about that literature at the time. I still have a vivid remembrance of how I felt when I was standing at the India Office in London before the big heaps of palm-leaf manuscripts, and how the Digha Nikaya, the Majjhima Nikaya and whatever the names of these now well-known texts may be, appeared to me as a terrifying host of unknown and rather uncanny beings. So much, however, was known at that time already that those texts give a picture of Buddhism essentially differing from that presented by the Nepalese ones. The Northern Buddhism is essentially one of myths, legends, folklore of all kind. In the south, on the other hand, if we confine our view to the canonical texts of the south, a much simpler, less richly coloured picture meets our eye—a Buddhism in the form of philosophico-religious speculation, and of strict monastic discipline. Which then of these two forms of Buddhism must be viewed as the more original one ? Against the idea which first suggested itself, that the original form was the simpler one, strong objections were raised. Senart *e.g.* sketched for us, mainly on the basis of the northern texts, a picture of original Buddhism in which the human figure of the Buddha was obscured almost entirely by the mythical shape of a solar divinity—a Buddhism which was built up with materials supplied by Comparative Mythology. But then there succeeded a period of strenuous literary activity which enabled us for the first time thoroughly to examine the claims of the rival theories. I think I am not saying too much if I assert that it was a connected series of happy accidents which widened, in the most welcome way, our knowledge of the sources on which all these investigations have to rest, and that in the most gratifying way each addition which was made to our knowledge intimately linked itself on to the others, all members of the series thus throwing light upon each other. It was at that time that we really came to know the Pali texts for the first time. It was given to me to place the Vinaya texts before the learned world ; on a much larger scale the Pali Text Society has ever since been working, and thanks to its resources Prof. Rhys Davids and his collaborators have been able to publish almost all the more important texts of the Sutta and the Abhidharma Pitaka. And, whatever lacunae still were left are now

being filled by the fine edition of the entire Tripitaka which we owe to the munificence of the late King of Siam, and by the Burmese writers. The former, unavoidably rather imperfect and indefinite, idea of the Pali texts was thus replaced by full and accurate knowledge. And now the time had come to decide whether the simplicity of this literature really indicates originality, whether through this simplicity the traces of older complication may be discerned ; for if the hypothesis of such complication should correspond to the facts, traces of that older complicated character would hardly fail to be met with here and there in the masses of those ample texts, and to be discovered by the practised eye of the philological critic. But t was not only our knowledge of the southern texts which was widened at that time. Some of the most important northern texts also became accessible to scholars then only. Cowell and Neil gave us the Divyvadana ; Senart enriched our knowledge by his great edition of the Mahavastu. In addition, we were learning to make a more fruitful use of the non-Indian versions of Buddhist books. Of the immense extent of what China offers in that department, the Catalogue of Bunyiu Nanjio gave us an idea, and specimens—before long more than mere specimens—of those treasures were made available to non-Sinologues also. I yet have to mention a most important and I think most unlooked-for enrichment of our knowledge. Important journeys of exploration in countries to the north of India began to be undertaken. Dutrueil du Rhins died the death of a hero in the service of research. Soon after that there came the series of those great explorations which were initiated by Dr. Stein—now Sir Aurel Stein—and continued, with results of imperishable value, by Grunwedel, Le Coq, Pelliot and others. These explorations to the north of India provided us with considerable fragments of texts of the highest importance through which it became possible for us to make a large advance in the reconstruction of the history of ancient Buddhistic literature. In fact, the basis on which such a reconstruction has to rest, had now become an infinitely wider and securer one. Burnouf had been unavoidably compelled to advance through the texts on which he based his wonderful 'Introduction,' with very rapid steps. We cannot sufficiently wonder at the multitude of things which that greater investigator had been able to see during this rapid progress. To us it is possible, and therefore a duty, to examine the texts microscopically as it were. We study the details of their linguistic and metrical peculiarities; we enquire whether the exposition runs on in an unbroken current as it were, or whether in certain places the even flow appears to be checked or broken—we in fact avail ourselves of all the critical and philological methods which may enable us to penetrate into the history of the origination of the texts, to discern the layers

which have gradually deposited themselves on their first form. Now, as soon as this procedure began to be applied to the comparison of the Northern and the Southern Buddhistic texts, a very clear and remarkable result at once declared itself. The northern texts—such as the Lalita-vistara, the Mahavastu, the Divyāvadāna, the Avadānaśataka—universally reveal beneath the multicoloured surface of legendary tales—those masses of tales which are the eminently characteristic feature of the northern texts as contrasted with the southern canon—a deeper layer which taking into account all the circumstances of the situation, we doubtless have to view as the older one. And this older layer displays exactly the same characteristics as the Pali texts, nay often agrees with the latter almost verbatim through long passages. This I think absolutely decides the question of relative priority, in favour of the southern type of literature. The question is fully decided because we find now that the northern texts also bear testimony to the priority of that type: this we observe as soon as we, separating the several layers of those texts from each other, take into account the oldest layer only. The result thus arrived at is finally confirmed by the finds made by Grunwedel, Stein, Pelliot. We here see emerging into daylight from beneath the sand of central Asiatic deserts, in the extreme north of the sphere of Indian Culture, texts clearly displaying that type which formerly was held to be the exclusively southern one—texts which, through shorter or longer passages, closely agree with the southern ones in contents as well as in style, and often in words and phraseology. We thus again arrive at the result that to the type called 'Southern' the north also bears witness.

It remains to mention another interesting fact. If we recognize within the northern literature an element of southern character forming a kind of old substratum as it were on which the further northern development has built itself up, we on the other hand also find, in a certain way, the northern literature within the southern one. But where does it meet us there? Not within the sphere of the canonical books themselves: from those we rather have to descend into the sphere of the commentaries. And there we reach, in the south also, that stratum which in the north displays itself at such great width—the stratum of endless masses of legends and miracle stories in which a luxuriant and unrestricted fancy ever strives to outdo itself by rising from the strange and wonderful to the ultra strange and ultra wonderful. Is not the relation of the two literatures fully characterized and determined by the way in which in each of them we meet with the particular features of the other? We recognize the main characteristics of the southern literature in the northern one as soon as we descend from the surface of the northern texts to the oldest, so to say

subterranean layer. On the other hand, the characteristic features of the northern literature shine out from the southern one, when from the southern texts we advance to the commentaries, i.e. if we penetrate into a layer which clearly is younger than that of the texts themselves. I venture to hope that on the basis of considerations such as I have sketched, the old controversy regarding the two great types of Buddhist literature is practically decided. Now we are in a position to attempt, in peace of mind, the reconstruction of the oldest form of Buddhism which is accessible to our research. We shall find the centre of gravity of that Buddhism not in myths, legends or folklore, but in philosophical thoughts and ascetic practice—those thoughts and that practice which have found their expression in the four Āryasatya—those great enunciations of suffering of the world and the way to release, and in the monastic ordinances which are so vividly presented to us in the Prātimoksa Sūtra. Our sources further show us, I think, with great clearness how those thoughts and ordinances have originated. Here also, it seems to me, the advances made in research in the course of the last decennia enable us to gain a clear and definite insight into what has happened. The previous stage of thought out of which Buddhism was evolved is to be studied, it seems to me, mainly in the Upaniṣads. We trace and define the line of development running from the older Upaniṣads such as the Bṛhad Āraṇyaka to the younger ones such as the Kaṭha Upaniṣad ; and we see how the oldest Buddhistic texts that are accessible to us join themselves on again as younger productions to such later Upaniṣads. This result is in full harmony with the result at which we had previously arrived. The old Buddhism, of which I attempted to give you a sketch in outline—the Buddhism not of the legends, but of thought and asceticism ; is it not just what is to be expected on the basis of the Upaniṣads ? The conception of the suffering necessarily inherent in all existence in this transitory world begins to appear in its rudiments in the Upaniṣads and becomes the leading idea in Buddhism. The belief that a man may escape from this suffering by renouncing the world and wandering about as a mendicant first appears in an undeveloped form in the Upaniṣads and then attains to full power in Buddhism, creating an abundance of institutions in which it manifests itself in living and palpable forms. Buddha and the old Buddhism are the true descendants of that Yājñavalkya whom the Bṛhad Āraṇyaka places before us—the sage whom this multiple world with its distinction of object and subject fills with deep dissatisfaction, and who from this home, which is no true home, passes over into the homelessness of spiritual life. Is it thinkable that men, troubled by those deep and imperious wants of the heart which all those texts reveal to us, should have found their satisfaction in

listening to amusing legends or in making collections of Jātakas? I believe that those spiritual wants could not but lead on to a system of thought, and a scheme of life which connected themselves with altogether different centres—to a system of thought which endeavoured to fathom the mystery of the suffering of the world; to a scheme of life which in all its details had no other aim, but to escape from that suffering. I do not overlook the circumstance that the enormous fertility of Buddhism in legends and tales of all kind is a fact which we have to recognize as such and to assign to its proper place. But this place does not coincide with the place where Buddhism originated, with the centre of the Buddhistic world of thought. It goes without saying that the task of thoroughly investigating those legends, in the first place the Jātakas, must not on that account be neglected; and the accomplishment of this very task also appears to me to have considerably advanced in the course of the decennia of which I am speaking. Here also the foundations, on which research has to rest, have in the first place been secured by large publications of texts. I cannot mention this without recalling, with gratitude and veneration, the great scholar whose name here pre-eminently suggests itself: I mean Fausböll. But to the Corpus of the Jātaka first made accessible to scholars by him there now join themselves, in ever-increasing abundance, the Jātakas of the northern literature which are contained in texts such as the Mahāvastu. Thus we now are in a position to compare in a good number of cases the southern and the northern texts, and to raise the question which of the two exhibit more primitive features. We can attack the important question how far the Pali Prose of the Jātakas, which we know to be no more than the prose of commentators, truly represents the original form of the prose tales which have to be presupposed for the Jātaka verses. In especially lucky cases the tradition of the monuments co-operates with the southern and northern traditions, and by this means it may become possible to trace the history of certain Jātakas through a whole series of stages with full certainty—as M. Foucher has actually and most beautifully done in the case of the Jātaka of the Elephant with six tusks. It is true that we have not yet advanced so far as to be able to write a history of the Jātaka literature; but I believe that we are approaching that point step by step. May I in conclusion venture to point out at this place a special problem connected with the Jātakas towards the solution of which some steps might perhaps be taken here at Calcutta? We so far possess the Jātaka collection as a whole in its southern form only. From the north we only have a large number of individual Jātakas as, *e.g.*, those received into the Mahāvastu, and certain small collections such as the Jātakamālā. But in my opinion there can be no doubt that the

Jātaka texts in their entirety were not a separate possession of the southern literature, but a general possession of Buddhism as a whole. Is there any hope of our being put in possession of a Northern Jātaka corpus also ? Brian Houghton Hodgson mentions among the manuscripts which are said to exist in Nepal a Jātakamālā of about 560 sections. This number approximately agrees with the number of the Pali Jātakas, but is somewhat higher. May we consider this as pointing to the existence of a northern recension of the entire Corpus of Jātakas ? Is there any hope of the manuscript to which Hodgson's note refers being actually found ? The hope, I am afraid, is only a faint one. An enquirer who himself had the most ample opportunities to experience good and bad fortune in his search for MSS. in Nepal, M. Sylvain Levi, writes to me : "One can no more direct one's search for MSS. in Nepal towards some particular work, than the fisherman can choose his particular fish." He may be right. But should we on that account omit to keep our attention directed towards that MS., and to follow up any traces which might lead us towards it ? Can something towards that end be done at Calcutta from where so many a connecting line leads towards Nepal ? Should we some day succeed in getting hold of a northern book that would form an exact parallel to the Southern Jātaka collection —truly my imagination is not sufficiently powerful to form an adequate idea of the splendour of the triumph which that would mean !

But I must break off. I have attempted shortly to indicate the direction which the finds and researches of recent times have as it seems to me assigned to the treatment of some of the fundamental problems of Buddhistic research. Work done in India or in Asia generally, and work done in Europe—both are jointly contributing towards our advance. And if to-day I have the great good fortune of standing at the place which forms the centre of all the work that is done in India and Asia I am confident of having the approbation of all my European fellow-workers if I give expression to our feeling of joy at this co-operation, of our admiration for all that has been done, and is being done, by this Society. Ladies and Gentlemen, be pleased to receive my sincerest thanks for the kindness with which you made it possible for me to meet you in this place and have afforded me an opportunity of giving utterance before you to what necessarily engrosses the thought of a European Indologist coming amongst you—what engrosses his thought and what moves his heart.

13. Action of Stannic Chloride on Phenylhydrazine.

By Jitendra Nath Rakshit.

The preparation of phenylhydrazine by the reduction of diazonium chloride with the simultaneous oxidation of stannous chloride to stannic chloride in aqueous solution (Meyer, Lecco, *Ber*, 1883, 16, 2976) is a proof that the reducing property of phenylhydrazine as salt is less than that of stannous chloride in solution. This investigation was undertaken with a view to ascertain whether the reaction is reversible under different conditions, with the base in the free state and stannic chloride in the anhydrous condition. From the great reactiveness of fuming stannic chloride, the chlorination of phenylhydrazine was expected, as well as compounds similar to the sulpho-derivatives like $C_6H_5N_2H_2SO_3K$ (Fischer, *Annalen*, 1877. 190, 67); the place of potassium being taken by tin and that of SO_3 by chlorine. Attempts to obtain any such compound have not been attended with success.

Both phenylhydrazine and stannic chloride being liquids, no solvent is necessary to bring about the reaction; on the contrary, when they are brought into contact the reaction commences with such vigour and so much heat is evolved, that if any compound like diazonium chloride were formed it would not exist at that temperature; necessarily, the formation of such compounds can only be inferred by isolating their products of decomposition. Diazonium chloride decomposes according to the equation :—

$$C_6H_5N:NCl = C_6H_5Cl + N_2.$$

Now if phenylhydrazine comes back to diazonium salt the following equation will represent the reaction, assuming that stannic chloride becomes stannous chloride, giving off two atoms of chlorine,—

$$C_6H_5HN.NH_2 + 2Cl_2 \longrightarrow C_6H_5N:NCl + 3HCl$$
$$\longrightarrow C_6H_5Cl + N_2.$$

Even if there be formed a compound analogous to $C_6H_5N_2Cl$, Cu_2Cl_2 (Erdmann, Annalen, 1893, 272, 144) that would not be likely to decompose, yielding chlorobenzene, at that high temperature :—

$$C_6H_5N.Cl, SnCl_2 = C_6H_5Cl + N_2 + SnCl_2.$$

The fact that chlorobenzene is not a product of the reaction is however no proof that diazonium chloride is not an

intermediate product. Chlorine in combination with phosphorus, arsenic, or boron does not decompose the base but forms definite compounds (Michaelis, Oster, *Annalen*, 1892, 270, 123), whereas stannic chloride causes complete rupture of it. Again, the decomposition of the diazonium salt in the presence of a hydroxyl group is much influenced by the radical with which it is combined. Phenol and nitrogen are formed by its decomposition in aqueous solution :—

$$C_6H_5N_2Cl + H_2O = C_6H_5OH + N_2 + HCl.$$

In alcoholic solution the products are not quite similar, the alcohol causing partial reduction of benzene diazonium salt, being itself oxidized to aldehyde (Griess, *Annalen*, 1866. 137, 69, 18 3, 217, 189: Ber., 1876, 9, 899).

(1) $C_6H_5N : NCl + C_2H_5OH = C_6H_5OH + N_2 + C_2H_5Cl.$
(2) $C_6H_5N : NCl + CH_3CH_2OH = C_6H_6 + N_2 + HCl + CH_3.CHO.$

The formation of benzene may be increased by reducing the diazotate with alkaline stannite (Friedlander. Ber, 1889, 22, 587).

Under conditions such as will be described, pure benzene is formed by the action of stannic chloride on phenylhydrazine; this can be explained either with the assumption of the intermediate formation of diazonium chloride or without it. The following equation will represent the reaction if diazonium chloride is formed :—

$$RHN.NH_2 + 2Cl_2 = RN : NCl + 3HCl.$$

Now since autoreduction is possible in the case of phenylhydrazine (Chattaway, Trans. Chem. Soc., 1911, 99, 404), the diazonium salt may next take up hydrogen from another molecule of phenylhydrazine :—

$$N : N\begin{cases} Cl & H \\ R & H \end{cases} \qquad N.N\begin{cases} R \\ \\ H \end{cases}$$

The intermediate formation of diazonium salt is probable, considering the explosive violence with which the reaction takes place.

The other equation that may represent the reaction is—

$$C_6H_5.N.N\begin{cases} H & Cl \\ + & \\ H & Cl \end{cases} = C_6H_6 + N_2 + 2HCl.$$

but such behaviour of chlorine of stannic chloride is not expected from the existence and properties of the molecular compounds of ammonia and stannic chloride, $Sn\,Cl_4\,(NH_3)_4$

(Persoz, *Ann. Chem. Phy.* 1830, (2) 44, 322) and Sn Cl_4 $(NH_3)_2$ (Rose, *Annalen, Ph. Chem., Pogg.* 1832, 24, 163).

It is very interesting that ammonia forms a stable compound with stannic chloride, whereas hydrazine, so similar to it, undergoes complete rupture.

Nothing, however, can be inferred from the liberation of hydrochloric acid; according to the first method two molecules of phenylhydrazine liberate four molecules of hydrochloric acid, and according to the second, one molecule yields two. The question whether the rupture takes place through the diazonium salt or not cannot be quite concluded and remains to be settled by further experiments.

Experimental.

In a litre distilling flask, 20 c.c of phenylhydrazine is poured; it is then fitted with a condenser and kept immersed in a large quantity of water. 15 c.c of redistilled fuming stannic chloride is added through a tap funnel. The reaction does not at once commence but is hastened by stirring. Perhaps a thin layer of a third substance is formed between the two which prevents their actual contact. All of a sudden the reaction begins, and it is finished almost with explosive violence in three or four seconds, the whole flask being filled with dense white fumes. After the fumes have subsided the cold water is replaced by boiling water. It is so arranged that the whole of the flask is heated with steam. 8·4 c.c of what was found to be pure benzene was collected, all of which distilled at 80° C. The gas evolved was found to be nitrogen. If the flask is not carefully cooled during the reaction, so much heat is disengaged that part of the phenylhydrazine undergoes decomposition according to Chattaway's (loc. cit.) equation,—

$$2RHN.NH_2 = R.NH_2 + N_2 + NH_3 + RH.$$

For the quantitative estimation of the evolved nitrogen the apparatus figured below has been designed.

0·2 c.c of phenylhydrazine was placed in the flask and 2 c.c of stannic cloride in the tap funnel. The temperature of the water bath surrounding the flask was 23° C, that of air being 23° C. After adjusting the level, the reading of the burette was taken, the pressure was slightly decreased by lowering the bulb, and suddenly the stop-cock was turned and all the stannic chloride dropped in. When the reaction commenced, there was a sudden increase of gas volume and the pressure was increased sufficiently to keep the level of the water in the burette constant. After the reaction, contraction of the gas followed and the level was maintained constant as far as

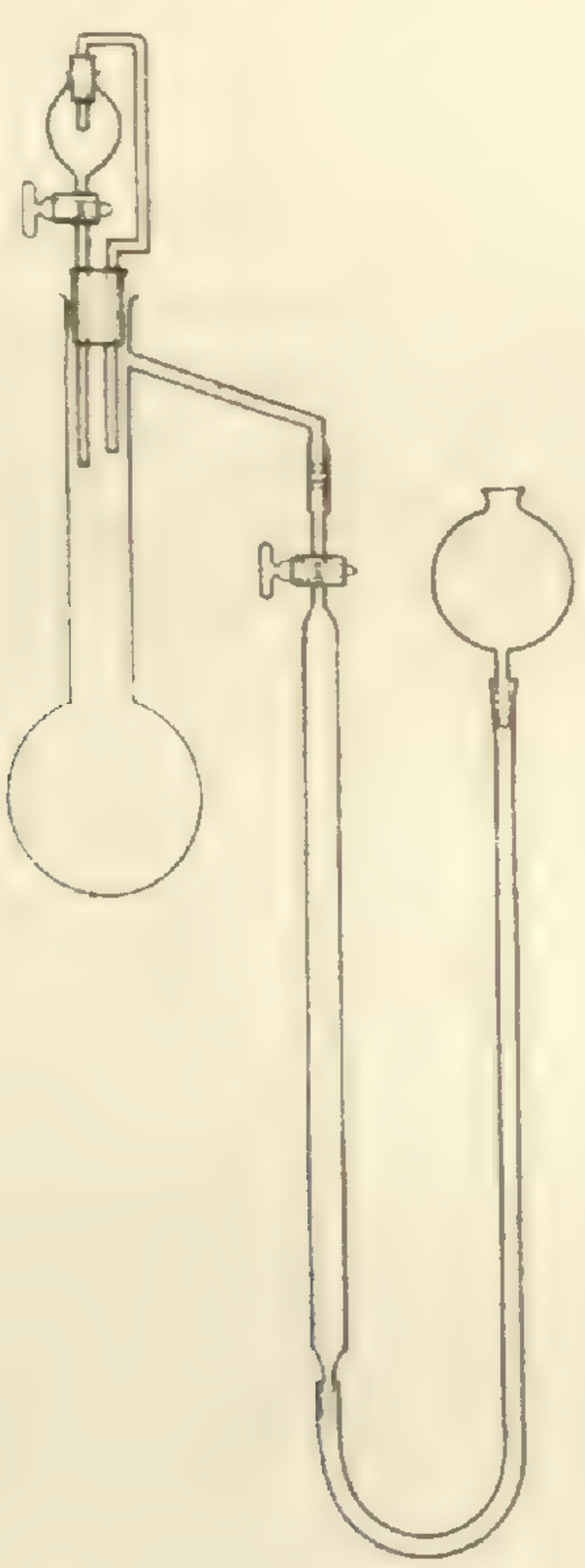
practicable. Next the temperature of the bath was regulated to 23° C and the gas generated was found to be 25 c.c at 23°C.

The residue in the flask was dissolved out in water, tin was separated as sulphide, and the filtrate evaporated on a water bath. Beautiful crystals of phenylhydrazine hydrochloride weighing 0·143 grm. were obtained. The estimation of phenylhydrazine in the substance was made by liberating nitrogen in a Crum's nitrometer with copper sulphate and acetic acid—

0·0749 grm. gave 14·1 c.c N_2 (moist) at 30° C. 760 mm.;

1180 grm. gave 22·0 c.c N_2 (moist) at 30° C 760 mm.;[1]

percentage of N found, 19·89 and 20·26 respectively; the calculated percentage for $C_6H_5N_2H_3$, HCl is 19·37.



Evidently, the substance is pure phenylhydrazine hydrochloride. Eight different experiments, adding excess of stannic chloride, have been performed, and the ratio of the molecules of phenylhydrazine, phenylhydrazine hydrochloride, benzene and nitrogen has been found to be 2 : 1 : 1 : 1 varying within the limits of experimental error. Blank experiments have been made to determine whether stannic chloride decomposes phenylhydrazine hydrochloride or not, and it has been found that it has no action under ordinary conditions.

[1] The vapour pressure of the benzene liberated by the reaction has not been taken into account in the calculation and the figures for nitrogen are consequently somewhat high. Several other determinations yielded similar results.

After the decomposition of one molecule of phenylhydrazine two molecules of hydrochloric acid are formed.

$$C_6H_5H.N.NH_2 + SnCl_4 = C_6H_5.H + N_2 + 2HCl + SnCl_2$$

and if these two molcules of hydrochloric acid require two molecules of free phenylhydrazine for their neutralisation the final reaction would be represented by the equation—

$$3C_6H_5H_3N_2 + SnCl_4 = C_6H_6 + N_2 + 2C_6H_5H_3N_2HCl + SnCl_2$$

but what really happens, as can be deduced from the data obtained, is represented by the equation—

$$2C_6H_5H_3N_2 + SnCl_4 = C_6H_6 + N_2 + SnCl_2 + C_6H_5H_3N_2, 2HCl.$$

At first it was thought to be quite anomalous that one molecule of phenylhydrazine should fix two molecules of hydrochloric acid; consequently the formation of some double salt with the chlorides of tin was suspected. Thorough search was made for any compound or compounds analogous to those with cadmium, cobalt, zinc, manganese, and nickel haloid salts prepared by Moitessier (*Centralblatt* 1897, 2, 297), but none was found. Hence one molecule of phenylhydrazine must have been combined with two molecules of hydrochloric acid, and this conclusion is further supported by the existence of two salts of the base with hydrofluoric acid,—

$$C_6H_5H_3N_2,HF \text{ and } C_6H_5H_3N_2,2HF$$

(Thieme, *Annalen*, 1893, 272, 209). The acid salt with hydrochloric acid decomposes in aqueous solution, neutral salt and free acid being formed.

I have much pleasure in expressing my best thanks to Prof. P. C. Rây for the interest he has taken in my investigations.

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14. "The A-ch'ang (Maingtha) Tribe of Hohsa-Lahsa, Yünnan."[1]

By J. Coggin Brown, M.Sc., F.G.S.,
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[With Plate IX.]

The A-ch'angs are one of the smaller groups of the lesser known tribes of the Burma-China frontier, whose exact position in the generally accepted scheme of racial classification is still a matter of controversy. In view of the growing tendency of some Indo-Chinese anthropologists to include them with one or other of the various branches of the Tai family, it appears to me to be desirable to collect the scattered references we have regarding this interesting group of people, and to reconsider the question of their origin in the light of later knowledge gained during a short residence in their headquarters, the twin States of Hohsa and Lahsa.

These twin States are situated about Lat. 24° 27′, Long. 97° 56′; at a height of some 4,500 feet above the level of the sea. They lie across the Burma border and are governed by semi-independent chieftains who own allegiance to the Chinese Republic, being in the days of the late Manchu dynasty under the direct jurisdiction of the T'ing of Têng-yüeh, whose immediate superior was the prefect, or Fu of Yüng-ch'ang Fu. This prefecture formed part of the "*I-hsi-dao*" or western division of the province of Yünnan. Both States are in the valley of the Nam-hsa, a tributary of the Ta-ping which breaks through the Kachin frontier hills in a narrow gorge, and enters the Irrawaddy just to the north of Bhamo in Upper Burma. The plain itself is some 16 miles long (running approximately east north-east, west south-west) and about 2 miles wide, though it narrows considerably at each end. The eastern half of the valley belongs to Hohsa and the western to Lahsa; both States, however, include tracts of country in the surrounding hills, though the true A-ch'ang population is confined to the plain. High bounding ranges rising to 6,000 and 7,000 feet, separate the States on the north from the Chinese-Shan State of Kanai (Möng-na), and on the south from Möng-wan. It would be difficult to imagine a greater contrast than that presented by these bare rounded heights, practically devoid of trees, and the forest-clad slopes of the almost uninhabited frontier ranges further west. The whole of the plain is devoted to rice cultiva-

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[1] Published by the permission of the Director, Geological Survey of India.

tion which is carried on to an intense degree, the villages being removed to the lower slopes of the bounding ridges that none of the available paddy land may be lost. Seen from the summits of the hills around, this well-watered valley seems rich enough, but as a matter of fact the appearance is deceptive, for the soil is poor and the crops suffer accordingly. The rice grown is not sufficient for the needs of the population, and as a consequence large numbers of the inhabitants emigrate year by year to neighbouring States, and across the frontier into the towns and the villages of Upper Burma and the Northern Shan States, where they are well known as the blacksmiths and carpenters who travel over the country in the cold weather seeking for employment. Such conditions are also aggravated by Chinese immigration, for the State has a high altitude and a mild and healthy climate, so that the ubiquitous Yünnanese highlander can live and prosper therein. As a general rule the elevation of the Shan States in Yünnan is low enough, and the climate bad enough, to prevent wholesale Chinese settling, and the Shans are left mainly to themselves for the greater part of the year. The A-ch'angs have been referred to as gipsies, nomads, born wanderers, and great travellers; it is hoped that the explanation given here will end these fallacious descriptions, for such peoples never leave the boundaries of their own special territories "en masse," except under the unalterable influence of some very strong external pressure.

The Chinese element of the population is powerful and is tending to become more so every day. Chinese-Shans are also found in the valley, whilst the hills around are peopled by Chingpaw and a few Lisu and Palaungs.

From the days of the early writers on the tribes of Burma until the present time, the origin and relationships of the A-ch'ang have puzzled the scientific observer. John Anderson in 1871 gave the first connected account of the tribe, but he was so uncertain about its affinities that he hesitated to speak with any degree of confidence.[1] A smiliar spirit of uncertainty pervades all literature, thus Morgan Webb has this year stated that it is "highly questionable," and a "matter of much hesitation," to classify the A-ch'angs with the Marus, Lashis and Zis who are of undoubted and identical Tibeto-Burman stock.[2]

An A-ch'ang when questioned at first calls himself a Shan. This is due to the fervour of the proselyte, and also to the natural desire on the part of the smaller tribal clans in the lawless frontier regions, to ally themselves with some more powerful faction for safety's sake. The Shan himself does not hesi-

[1] (1), p. 100. (Numerals in brackets refer to works quoted at end of paper.)

[2] (2), pp. 201 and 263.

98
KACHIN HILLS
MARU
LASHI
MARU
ZI
NUNGU
ZI
KACHIN HILLS
SHAN STATES
PALAUNG
Myitkyina
Bhamo
Mogaung
Katha
Ta lung
Pun Nen
Myauk noc
Langyaw
Nhkum
Mawma
Chongma
Lawngnaung
Lawka
Nawku
Wa rang Pun
Hanna
Sidon
Chibwe Pung
11197
Tidaung
Lemaw
Kamaing
Tanai
Tingkawk
Tingra
Tanbar
Tasungla
Tungut
Salapat
Sima
Maimao
Hka Dung
3228
Tulung Pung
8571
Kamaing
Mam Parin
Nanglup
Mam Malu
Tanka
Nganga taung
Wa sile
Man Wung
3760
Hpa hpak
Hka hsa shan
6488
Wuntapung
7043
Louisi
Namma
5380
MONG MAO
Hpa tyu
Pyunga
Sa-wa di
Kaungtaung
Nanglaw
Hka nam
Tingai
Kan ngai
Nan-sung-kaung
Tinghang
Hkau ri
Ta lung
Kau-gin pum
Wa or
Ewi lao Ferry
Mung sa
Ma ra
Sampaw ma
Ya wyinsha law
Lang pra
Lawngnaung
Lau pawa
Hanuma
OLYITKYINA
Pun-ka tawng
Nongjun
Pun-tam
Mong tung
Htingra
Lau ka
Ka-zin
Ka-hkaw
Ka-hkaw
Ka-hkaw

tate to wear Chinese dress, and to put up an ancestral tablet in his home, should there be any temporal advantage to gain by being mistaken for a true son of Han. And in the same way all tribespeople in Yünnan affected by Chinese blood and influence, persistently ascribe their origin to the eastern provinces of China, whence their new Chinese relatives have certainly come within the last few centuries.[1]

The Yünnanese refer to the A-ch'ang as A-ch'ang or Nga-ch'ang. The Shans call them Tai Möng Hsa or Tai Hsa, Möng Hsa being the general name for Hohsa and Lahsa. To the Burmese they are known as Maingtha, which is a corruption of Möng Hsa. On close questioning the A-ch'ang admits readily enough that he is not a Shan, a view which was also expressed to me by the Sawbwa of Lahsa. I have never succeeded in persuading any individual to own his kinship with the despised "*ye ren*," the wild men of the hills, a term applied by the Chinese to Chingpaw, Lisu, Maru and all such peoples. Hohsa and Lahsa are governed by *sawbwas* or chiefs who trace their ancestry to Chinese military commanders, sent from Ssu-ch'uan some 400 years ago to quell rebellions on the Yünnan border. For their successful services these leaders were given not only the present A-ch'ang States, but the Chinese-Shan States of Kanai and Nantien as well, which their descendants now rule. The families have intermarried to a great extent with the indigenous peoples, and have lost the typical Chinese cast of feature, though they invariably assert their Chinese ancestry. When I visited the A-ch'ang country in 1910 the Hohsa Sawbwa was a youth about 16 years of age, who was engaged to marry one of the daughters of the Kanai chief. The Lahsa Sawbwa was an elderly man, with the dress and habits of a pure Chinese.

It has often been asserted that the A-ch'angs resemble the Shans very closely, but this is not the general rule. As far as my experience with both races goes, I believe they usually differ very considerably. In stature they are a smaller race than either the Chinese or Burmese Shans, both men and women being of short but sturdy build, with darker skins, smaller and flatter faces, and more prominent cheekbones than the typical Shan. Anderson remarked, "The breadth between their eyes is considerable, their mouths are generally heavy, and the lips more or less protruding."[2] To the practical anthropometrist these differences are very apparent, and venturing a suggestion in the absence of detailed measurements, the average A-ch'ang appears to me to bear a closer relation to the Chingpaw type of the Tibeto-Burman family, than to the Shan, as far as features and outward appearances go.

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1 (3), p. 258.

2 (1), p. 101.

The dress of the male A-ch'ang is much the same as that of the Chinese Shan, but the woman's dress has many distinctive features. I am unable to add anything to Anderson's excellent descriptions, which appear to have been overlooked by other writers. I therefore propose to rescue them from the unmerited oblivion of an ancient report and to reproduce them here:—

> "The costume of the male peasantry is a double-breasted loose jacket reaching to the loins, and buttoned down the right side. The buttons are frequently jade, amber or silver. Their turbans are thick blue cotton cloth, with a long fringe at the free end, which is usually wound up with the pigtail, and brought round the outside. In rainy and sunny weather a very broad straw hat, covered with oiled silk, is worn over the turban. Their trousers are very loose, and reach only a short way below the knee. The shins are bound round with long strips of blue cloth to protect them against injury, a fashion that seems to prevail not only among the Shans and Kakhyens, but also among the Chinese peasantry generally. Their shoe uppers are made of thick blue, almost felt cloth, embroidered with narrow braid, and with thick leather soles."[1]

With regard to the women's dress Anderson writes:—

> "They wear the Shan jacket, and loose trousers like the men, but with the ends unhemmed. The back half of the jacket is prolonged downwards to below the knees like a long divided coat-tail, and a double Chinese apron is worn in front, and with the tail completes a kind of skirt. In addition to the silver plate-like brooches, the shoulders are ornamented with an epaulet of small hemispherical discs, the one on either side being connected by a line of silver buttons passing round the shoulders. The waistband of the apron is about six inches broad, and dilates behind into a richly embroidered piece that forms a distinctive feature of the dress of that peculiar people. They seldom wear shoes. Their head-dress, however, is the most striking feature in their attire, and consists of a hoop about six inches in diameter, made of cloth wound round a rattan, and placed on the crown of the head, with the hair in front transversely divided and gathered up, with that of the back, into the centre of the hoop, and plaited into the ends of a flat chignon of the dimensions of the internal diameter of the hoop. The latter is kept in position by about 25 to 30 silver pins fastened into the chignon and mass of hair, with their heads resting on and completely hiding the hoop. The pin heads are large, thin, flat plates

[1] (1), p. 102.

of silver, placed longitudinally to the length of the hair, and either embossed or engraved with figures of leaves or of flowers. The result of this arrangement is that the crown of the head is encircled with a silver wreath of the diameter of the hoop; and outside it is wound a scanty blue turban, to the fringes of which a number of silver finger-rings are usually tied, and allowed to hang down behind. In full dress, in addition to the ordinary hair pins, four much larger, usually richly-enamelled, ones are worn at the front, back, and sides of the circle. ..... Full dress chignons and their pins are a foot in diameter. The head of a pin of this kind is eight inches in length, by two in breadth, and of the most intricate construction. The simplest is made of silver wire, and flat pieces of the same metal cut into fantastic figures and representations of trailing plants, in full flower, the colours being given by various enamels, of which green, blue, purple, and yellow are the chief. In some the leaves are worked out in the finest filigree, and in one specimen I purchased, there is a figure resembling a swan resting on its outstretched wings among a bed of flowers."[1]

For the sake of comparison I give here Anderson's description of the dress of the ordinary Chinese-Shan woman of Kanai or Nan-tien, the neighbours of the A-ch'angs on the north, and with whom the latter are constantly confused:—

"Their ordinary garb is very sombre, but their peculiar head-dress, like an inverted pyramid, gives them an *outrè* appearance in the eyes of a stranger. It consists of a long band, or rather a series of long blue scarfs, about 1 foot broad and of a total length of 40 to 50 feet long, wound round the head with great regularity, and towering upwards and backwards in a large pile, the free end of which is usually fringed, and embroidered with pretty devices in gold and silk thread. The folds are arranged in a crescent over the forehead with the greatest precision and neatness, and occasionally a few silver ornaments are fastened to the front of the turban, or attached to the embroidered end, which is allowed to hang a short way down the neck. The top of the head is left uncovered in the centre of the turban, and the hair is ornamented with silver hair-pins, with flat heads with richly-enamelled representations of flowers and insects. The jacket is short and moderately loose, and has a narrow erect collar. It is fastened at the neck, and down the centre, by a number of thin, square, enamelled plates of silver; and in full dress, the shoulders and a line down the back, and another in front, are covered

[1] (1), p. 104

with large hemispherical silver buttons, richly embossed with figures of birds and flowers, enamelled in various colours. The sleeves are rather loose from the elbow, and usually folded back, showing a massive silver torque-like bracelet A tight, thick cotton skirt, frequently ornamented round the lower third with squares of coloured silk and satin or embroidered work, with a pair of close-fitting leggings made of the same material, and handsomely embroidered shoes, with slightly turned-up toes, complete their external attire. On particular occasions, a richly embroidered cloth is worn over the skirt."[1]

The A-ch'angs are expert silversmiths, and the craft has attained a surprising degree of development among them, as the beautiful design and finish of their ornaments testify. The women wear ear-rings, finger rings, neck hoops and bracelets which exhibit great variety of decoration and effectiveness. A common form of ear-ring, a specimen of which I have in my collection, consists of a flat open ring of silver wire, massively enriched with smaller silver strands, and carrying two engraved silver bosses near the opening in the circumference. From it is suspended a bell-shaped structure, made from an inverted silver rosette, with indented edges from which pendants are hung by fine silver chain work. Their use of silver wire, filigree, and delicate decoration in enamel is unsurpassed by any of the surrounding tribes.

The A-ch'angs are a quiet, inoffensive people, fervent Buddhists and exceedingly shy. In most of the Chinese-Shan States, the religion of Gautama is not followed with the zeal which characterizes it in Burma, thus while every village or group of villages has its "*wat*" or monastery, pagodas and zyats built by the pious believer are uncommon. Again, the Chinese-Shan Buddhist priests sometimes doff the yellow robe and follow the lucrative calling of the silversmith for a day. They are often inveterate smokers and addicted to the use of opium, and they do not beg their food from door to door in the ordained manner. In Hohsa and Lahsa, however, the priests are more orthodox, and their example is followed by the common people, so that the religion has retained its pristine simplicity, and is free from the laxity which blemishes Shan Buddhism, and which is doubtless due to th superstitions largely borrowed from surrounding Animistic tribes. The Hohsa Valley is shut in towards its south-western extremity by a low range of foot hills which is crowned by a group of pagodas of a type commonly met with in Burma.

A-ch'ang houses are usually built of bricks on the ground,

[1] (1), p. 102.

and not raised like those of the Shans and Burmese. Each village is surrounded by a low mud wall, or a thick cactus hedge, and stands sheltered in its own grove of bamboos or other trees. The residences of the chiefs are built after the fashion of an ordinary Chinese "*yamen*," and the walls are decorated with drawings of dragons, which is also a Chinese custom.

All the A-ch'angs speak Shan, and many of them know some Chinese as well It is owing to these facts and to their conversion to Buddhism that their true Tibeto-Burman origin has been lost sight of. They most certainly use their own tongue to a very considerable extent amongst themselves, and it was by the study of this dialect, influenced and added to by Shan as it is, that Major Davies was able to point out its proper association with the speeches of the Zi, Lashi and Maru,—the curious stranded groups of people left by the Burmese in the highlands of the N'mai Hka valley during their immigration from the north into the plains of the Irrawaddy basin.[1] Davies' evidence was sufficient to bring so high an authority as Sir G. A. Grierson to regard the A-ch'ang speech as more or less closely connected with Burmese, and to place the languages of the Zi, Lashi, Maru, Hpon, and A-ch'ang in a group called Kachin and Burmese hybrids. This distinguished author, however, is careful to point out that it is possible that these languages are not hybrids but independent forms of speech.[2]

A full and careful examination of these dialects is very urgently called for, the tribes themselves are being merged into more powerful neighbours with an amazing rapidity, and the oppo tunity cannot last very much longer in the case of some of them. As it is, the material which is now available, and which will go far to solve the foundations of the problems connected with Burmese civilization and culture, is vanishing without being recorded.

I propose to summarise here the views of the principal authorities on the A-ch'ang people.

In the first volume of the "Report on the Census of Burma of 1891," Mr. H. L. Eales with the assistance of Mr. B. Houghton, and the late Dr. Cushing, placed the Maingtha dialect with those of the Chinese-Shans, Ahoms, Hkamptis and Burmese-Shans in the Northern subdivision, of the Taic Shan group, of the Polytonic family.[3]

In the "Gazetteer of Upper Burma and the Shan States" published in 1900, Sir George Scott taking the researches of Captain (now Major) Davies as a basis, estimates that about 30% of the words of the A-ch'ang dialect appear to be connected with Burmese, and 12% with Shan. These latter are considered to have been borrowed from the surrounding Shans,

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[1] (4). [2] (5), p. 382. [3] (6).

as names for things of which they knew nothing until they met the Shans and were converted to Buddhism. The A-ch'ang language is thus shown to be very closely connected with Burmese, and its resemblance to the languages of the Zi, Maru, and Lashi is still more remarkable, while with the dialect of the Hpon of the upper defile of the Irrawaddy, it has many points in common Unfortunately Sir George Scott while considering the A-ch'ang a distinct race groups them with the Tarens, Tarengs or Turengs, who are said to be found on the western border of the Chinese-Shan State of Santa, and in Hkamti Long.[1]

In a later work Sir George Scott has abandoned this definite position and taken up an agnostic one. He now writes (1906), that the Maingthas should rather be called dragoman Shans than Burmese, "and that their speech should be called navvy's patter rather than a definite language. A literary Maingtha might make a language of it, just as English takes words from everywhere, even from cracksmen and destitute aliens. The Maingtha's dress proclaims him a Chinese Shan; his industry suggests the Chinaman; and his features suggest intermarriage with the Chingpaw. He will probably come to be called a worthy mongrel."[2] We are not concerned here with what the Maingtha may, or may not, eventually become, but with what he originally was, believing that in spite of admixture of blood and general racial disintegration, his Tibeto-Burman relationships can still be traced.

Mr. C. C. Lowis, I.C.S., in the "Report on the Census of Burma of 1901," again raises the question of the classification of the A-ch'ang or Maingtha, and while tardily admitting that Sir George Grierson is doubtless justified in including the Maingtha speech among the Burmese languages, speaks of the tongue as a conglomerate, "a pedlar's jargon, the outcome of generations of wanderings."[3] Following Sir George Scott he classifies the Maingthas with the Tarengs, indicating, however, that their dress and general appearance point more to a Chinese or Chinese-Shan affinity. Their home is said to lie for the most part near Hkamti-Long. Attempts have been made at different times to prove that the Tarengs, Turungs or Tairongs are Shans. Thus Lieut. (now Colonel) Gurdon ingeniously contracts or rather corrupts Tailong, (great Tais or Shans), into Tairong, and finally into Turung. He relates that they are generally regarded as Shans in the neighbourhood of the Hkampti country, and this in spite of the fact that the tribe in question spoke pure Singpho![4] Colonel Gurdon has fallen into the old, but unfortunately still prevalent, mistake,—the classification of a partially absorbed Tibeto-Burman clan with a Tai race, owing to the consequent masking of their

[1] (7). [2] (8), p. 95. [3] (9), p. 78. [4] (10).

peculiar lingual and physical characteristics. Should the Tarengs have turned out to belong to the Tai family, much weight would have been added to the arguments of those who would classify the A-ch'ang with the same race. The present tendency however is to regard Mr. Errol Grey's Tarengs, Turengs or Turungs as Chingpaw pure and simple.[1]

While I am unable to admit the identity of the Tarengs or Tarens with the A-ch'ang, it is interesting to note that the western borders of the Chinese-Shan State of Santa in Yünnan, are peopled for the greater part by Zis, a very closely allied people.

In a more recent work (1910), Mr. C. C. Lowis reiterates his previous opinion, that the Maingtha are probably merely Chinese-Shans, and that there is a far fainter Tibeto-Burman element in their language than was at one time supposed. He therefore no longer regards them as having a place in the same dubious category as the Hpons, who are now proved to be a Tibeto-Burman race which is in the last stages of absorption by the surrounding Shans.[2]

In the last Burma Census Report (1911), Mr. Morgan Webb, I.C.S., only places the A-ch'ang speech in the same compartment as that of the Zi, Lashi and Maru, as a tentative measure, and remarks that the "Maingthas have adopted the dress, customs, and religion of the Shans to such an extent that there appears to be nothing in common between them and the remaining tribes of the group." This writer however, admits that it is probable that their ancestry is a complex of Maru, Kachin, and Shan.[3]

It is unwise to judge the A-ch'ang, or the extent to which he has been modified by outside influences, entirely from the administered and enumerated areas in Burma, over which the poorer stragglers from the headquarters of the race have to wander, owing to circumstances beyond their own control. This surplus population in any case is less likely to approximate closer to the original ancestors of the race, than the settled members, living in their own country, and bound together by all the ties of communal interest. Beyond a doubt the race is fast disappearing, its manners and customs well nigh absorbed in those of the Shans, and its language rapidly becoming extinct, owing to the supremacy of the tongues of numerous and more virile neighbours. The process however has not gone so far as the last Burma Census figures would lead us to suppose,—otherwise all hope of future research would have nearly vanished.

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[1] (12). In this connection see also (12), pp. 16, 17, where the views of Davies and George are mentioned. This valuable work was not available until this paper was in the press.

[2] (11). [3] (2), p. 263.

The clue to the mystery was obtained by Davies, and it is certain that further knowledge will go to strengthen the connection between the A-ch'angs on the one hand, and the Maru, Lashi, Zi, and Hpon tribes on the other. Far from being the waifs and strays which recent literature might well lead the reader to imagine, these dying races have preserved for us the records of the immigration of the Burmese themselves into the regions which they now occupy. The unusual resemblances of the Maru, A-ch'ang, Zi, Lashi and Hpon speeches with Burmese, is not the family likeness of the other Tibeto-Burman tongues with that language, but "is sufficiently close to warrant the belief that at some not very distant period these races spoke one tongue."[1]

The N'mai Hka valley is still the home of the Marus, who extend southwards into the Northern Shan States and eastwards across the frontier a short way into the province of Yünnan. To the east of the Marus, the Zis are located, whilst on the west about the confines of the Bhamo and Myitkyina districts the greater number of Lashis are found. These tribes, with the Hpons, were the last stragglers of the Burmese immigration, or perhaps settlers in the hills, who preferred to remain where they found themselves than to travel further down the great river with the main body. I do not think there is any evidence for supposing that the Lashis and Zis are side branches from the Maru, the probability being rather that they are of common stock and origin, and that their present distinctions are later growths, consequent on the varying external influences to which they have been subjected. Each of the five groups has suffered by absorption into more powerful neighbours, and owing to intermarriage, warfare, and the practice of slavery there is now little left by which they can be distinguished. The Marus, Lashis and Zis are surrounded by Chingpaw, and "there is now very little outward difference between them and the Chingpaw"[2] The Zis even now consider that they belong to the Lepai clan of the Chingpaw, and although not recognized by the latter as such, the process of absorption is completer than in the case of the Lashis. A recent traveller through the upper part of the Maru country informed me that the Marus there had become Kachins, and that they could not now be separated.

In the same manner the Hpons and A-ch'ang have had to submit to the gradual dissolution of their peculiar tribal life, language and customs by a more peaceful, but none the less certain, onward movement of the Shans. The Hpons are in a more advanced stage of decay than the A-ch'angs. In both cases the chief factor has undoubtedly been the levelling, civilizing action of Buddhism,—a factor of greater importance

[1] (4), p. 363. [2] (11), p. 33.

than is often supposed when dealing with hybrid Indo-Chinese races. The introduction of the principles of Gautama, the influence of a literature, the growth of a priesthood, and the development of education would quickly tend to spread the speech and manners of the stronger tribe. In this respect the sacred book of the priest, and the trade route of the merchant, are every whit as potent as the conquest of the soldier, or the raid of the slaver.

Before concluding this paper, I would again draw attention to the necessity for a thorough and sympathetic study of the languages and customs of this interesting group of tribes, before they are finally submerged. In the words of Sir George Grierson, most of the dialects belonging to the Burmese group are all but unknown, and the same could be asserted with respect to the general ethnology of many of the tribes.

In this paper I have attempted to show briefly :—

(1) that, the language, appearance and dress of the A-ch'ang or Maingtha is sufficient to indicate their near relationship to the Maru, Zi, Lashi and Hpon tribes which form the Burmese section of the Tibeto-Burman group of languages ;

(2) that, originally they had no connection with any branch of the Tai or Shan group, as indeed their own traditions point out. Their absorption into the Shan race has been largely brought about by their conversion to Buddhism, as a result of the accident of geographical position ;

(3) that, the Maru, Zi, Lashi, A-ch'ang and Hpon tribes, as they are now known, are stragglers or settlers from the main Burmese immigration down the N'mai Hka into the Irrawaddy plains. The first three tribes were headed off and eventually separated from the main stock by Chingpaw clans, by whom they have been largely assimilated. The latter two coming into contact with Shans suffered the same process, complicated in the case of the A-ch'ang by extensive Chinese immigration ;

(4) that, in view of the rapid decay of the customs and language of these people, by their absorption into stronger races, and also of their great importance in settling the origin and early movements of the Burmese, further research is urgently called for at once. This should not only be linguistical, but anthropometrical and ethnological as well.

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15. Earliest Jesuit Printing in India.

From the Spanish of the Rev. Cecilio Gomez Rodeles, S.J.

Translated by the Rev. L. Cardon, S.J., and edited by the Rev. H. Hosten, S.J.

[The present article is a translation from the Spanish of part of *Imprentas / de los Antiguos Jesuítas / en las / Misiones de Levante / durante los siglos XVI al XVIII / Datos recogidos por el P. Cecilio Gómez Rodeles / de la Compañia de Jesús*,[1]/ pp. 4–17. The complete reprint of Fr. C. Gómez Rodeles' articles comprises pp. 56; for he retraces the origin and development of Jesuit printing, not only in India, but in Macao, Japan, China and Indo-China. To us here the chapter on Jesuit printing in India commends itself as the most interesting.

Block-printing, a Chinese invention, was known and practised in Tibet and Nepal from remote times; some 200 years ago, it was at times resorted to even in Bengal.[2] It is, however, a well acknowledged fact that the Jesuits were the pioneers in India of the European process of printing with movable type; but, whereas it was generally supposed that Jesuit printing began in 1577 under Bro. John Gonçalves, we now learn that a press had been at work at Goa since 1556, only 46 years after the conquest of that town by the Portuguese This early introduction of printing into India reflects no little credit on the spirit of enterprise of the Portuguese Jesuits, considering that Mr. Bolts complained in 1768 of the total absence of printing-presses in Calcutta. Printing seems to have begun in Calcutta only in 1778,[3] *i.e.*, 78 years after the foundation of Fort William. Bombay showed herself even more backward. The printing-press of the Danish Missionaries of Tranquebar was the first after those of the Jesuits (1712).

According to Fr. C. Gómez Rodeles, the Goa press was not the only Jesuit press in India. Others sprang into existence on the West Coast and on the Fishery Coast: at Vaipicota, Rachol, Cochin, Ambalacata, Angamale and Cranganore.[4] A certain number of the books printed were in Portuguese. Fr.

[1 (*Articulos publicados en la revista* Razón y Fe) / *Segunda Edición.* / *Madrid* / *Establecimento tip.* "*Sucesores de Rivadeneyra*" / *Impresores de la Real Casa* / *Paseo de San Vicente, núm. 20.* / *1912.* /]

2 Cf. Dinesh Chandra Sen, *Hist. of Bengali lang. and literat.*, Calcutta, 1911, p. 849.

3 Cf. *East and West*, March 1902, p. 550, quoting Dr. Busteed's *Echoes from old Calcutta.*

4 These two presses must have been the same as that of Vaipicota, which was occasionally shifted.

C. Gómez Rodeles limits his inquiry to the work done by Jesuit writers for the Indian vernaculars: Koṅkaṇī, Kanarese, Marāṭhī, Malayāḷam, and Tamiḷ. Some works were also printed in Ethiopic, and a large number of translations into Syriac was prepared for the use of the St. Thomas Christians.

To-day, when most of the Indian vernaculars have been thoroughly studied and classified, it is not easy for us to realize the hesitations felt by our predecessors in discriminating and denominating some of our allied dialects. Our early missionaries applied the term "Malabar" to both Malayāḷam and Tamiḷ; Kanarese was long a misnomer for Koṅkaṇī; the "Bracmana" tongue did not necessarily mean Saṁskṛt; at Goa it meant rather Koṅkaṇī or Marāṭhī; Badaga was Telugu, while Hindostānī applied even to Marāṭhī. These points, if not unknown to Fr. C. Gómez Rodeles, have not been touched upon.

Though the Catholic Missionaries of the West Coast must have recognized at a very early date the existence of a dead language among the Brahmaṇs, it was not until much later that some of them applied themselves to a study of it. The work of translation made in 1559 of what must have been some Saṁskṛt books appears as an isolated case. Fr. Francis de Sousa, S.J. (*Oriente conquistado*, Lisboa, 1710, vol. I, conq. I, div. II, nos. 42, 43) relates how a Brahmaṇ convert, named Manoel, whom the University of Salamanca had honoured with the title of Doctor *utriusque juris*, robbed a Brahmaṇ Paṇḍit of his MSS., of 18 volumes of the "Gita Veaco" and other authors ancient and modern.[1] He brought them to Goa and translated the substance of them into Portuguese. Fathers Gonçalo de Sylveira and Francisco Rodriguez, S.J., drew up a refutation of them point by point. Fr. de' Nobili studied Saṁskṛt in the beginning of the XVIIth century, and so did several other Jesuit Missionaries at a later date: H. Roth (Mogor), Beschi (Madura), Calmette, Cœurdoux, Pons (Carnatic), Mosac (Chandernagor), Bischopinck, Hanxleden, Pimentel, Hausegger (Malabar), Tieffentaller (Mogor). It is chiefly through the letters of some of these that the attention of European savants was drawn to the affinities between European and Indian languages.[2] As for the Missionaries near Goa, they do not appear to have busied themselves with the study of Saṁskṛt. The term "Bracmana" as used by them is to be

[1] The story is given at full length by Fr. A. de Quadros, S.J. (Dec. 1559) in *Epistolæ Indicæ. De Stvpendis Rebvs .. in India..*, Lovanii, 1566, pp. 292–299. "Veacus" is there supposed to be some ancient author. "In libris nescio cuius Veaci, quem tanquã principem. coripheũ æstimant; quiq; 18. Cõmentariorũ volumina in patrias leges, aliasq; cõstitutiones variorũ doctorũ suo tẽpore reliquit." Kṛṣṇa appears under the form "Risinus," p. 298. In another letter from Goa (1560) "Guita" is taken for a person (p 376).

[2] Cf. the chapter on Saṁskṛt in Fr. J. Dahlmann, S.J., *Die Sprachkunde und die Missionen*, Freiburg, 1891.

explained by such other terms as we see them use, *viz.*, "Bracmana-Marasta," "Bracmana-Canarim," and "Bracmana vulgar," under which we recognize Marāṭhī and Koṅkaṇī.

Sir H. Yule (*Hobson-Jobson*, s.v. Canara) shows how the term Canarijs is applied by the old Portuguese authors to the Koṅkaṇī people and language of Goa. The Jesuit Missions in Kanara proper began only under Fr. Cinnamo, after 1644. Fr. Thomas Stephens' works are not then in Kanarese, but in Koṅkaṇī. The large admixture of Marāṭhī, which they contain, has made some look upon them as written in Marāthī rather than in Koṅkaṇī. The efforts made by Bro. John Gonçalves (*ante* 1579) to cast "Canarim" types must, probably, be understood of Koṅkaṇī to be printed in Kanarese type, since even now the Kanarese alphabet is generally employed for recording Koṅkaṇī.[1] Eventually, the Kanarese alphabet was made use of, we are told. (Cf. Dr. G. A Grierson, *Linguistic Survey of India*, Vol. VII, p. 167.) Our impression, however, is that the Portuguese Jesuit Missionaries printed Koṅkaṇi in Roman, *e.g.*, Fr. Thomas Stephens. (Cf. Fr. J. Dahlmann, *Die Sprachkunde und die Missionen*, Freiburg, 1891, pp. 7-22.)

A similar confusion obtained between Malayāḷam and Tamiḷ. Yule (*Hobson-Jobson*, s.v. Malabar) is correct, we believe, when he points out that the "Malabar" tongue in which Fr. Henry Henriquez, S.J., a Missionary on the Fishery Coast and at Cape Comorin, was said by St. Francis Xavier to be very proficient, was not Malayāḷam but Tamiḷ. This misapplication was general down to the beginning of the XIXth century, and still holds among the more ignorant Europeans and Eurasians in S. India and Ceylon. In the Bibl. Nationale of Paris there is a "*Grammaire pour apprendre la langue Tamoul vulgairement appelée le Malabar... Faite à Pontichéry et achevée le* 18e *Novembre* 1728 *par un Missionnaire de la Compagnie de Jésus de la Mission du Carnate.*"[2] The Catholic Missionaries of Burma still speak of their Tamil Christians as "nos Malabares."

There can be no doubt that Badaga meant Telugu (cf. Yule's *Hobson-Jobson*, s.v. Badega). Fr. de la Lane was the author of a Telugu Dictionary and a Telugu Grammar. A copy of the latter in the Bibl. Nationale of Paris is inscribed thus: "*Grammaire pour apprendre la langue Telenga dite vulguarement le Badega, faite à Pontichéry l' an* 1729 *par un Missionnaire de la Compagnie de Jésus de la Mission française du Carnate.*"[3]

[1] Cf. *Imper. Gazett. of India*, Oxford, 1907. Vol. I. p. 374.

[2] The author was Fr P. de la Lane, S.J. Cf. Julien Vinson, *Rev. de linguist et de philol comparée*, Paris, Maisonneuve, 1899. Vol. XXXII, 15 avr. 1899, p. 101.

[3] Cf. *ibid.*, p. ?

It must be understood that, though we have modernized Fr. Gómez Rodeles' spelling for the names of some of our vernaculars, we have left others in the form employed by the early missionaries, in order to avoid worse confusion.

Any words or passages within [ ] are ours.

H. Hosten, S.J.].

GOA.—When St Francis Xavier landed at Goa on May 6, 1542, he may be said to have taken possession of that town. Here, in course of time, and under the visible protection of God, the number of the Jesuits and the sphere of their civilizing action went on increasing.[1]

Goa was to become the Jesuit seminary for the whole East, for it was here that young men fresh from Europe, and the sons of Europeans chosen by God in India as evangelical recruits, completed their studies and prepared themselves for the apostolate.[2]

It was at Goa that the new missionaries took rest after their long and dangerous journey, that they learned one of the native languages, acquainted themselves with the manners and customs of their future neophytes, and trained themselves in the handling of spiritual weapons, until their Superiors distributed them among the immense kingdoms of the Rising Sun, for the most part under the sway of paganism.

Goa, finally, gave shelter with due charity to those who had sacrificed their health and strength in unwholesome climes, until they either recovered their former vigour or were called away to receive in heaven the reward they had merited by their apostolic labours.

In 1573, thirty years after the arrival at Goa of the Apostle of the Indies, that capital with its neighbourhood had a population of 90,000 Christians, 2,500 of whom had been that very year regenerated in the waters of Baptism.

As many as 500 children were taught in our Goa schools the rudiments of letters, the Christian Doctrine[3] and Christian morality; these together with a hundred orphans were maintained at the expense of the college.[4]

In the beginning of the year 1576, nearly the whole island of Goa was Christian, and, though the number of evangelical labourers in the East was rather small, yet there were at Goa 100 Jesuits, mostly students perfecting themselves in virtue and learning.

Civilly, that great city was the emporium of Portuguese trade in India and the seat of the colonial Government.

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[1] *Monumenta Xaveriana*, t. I, p. 250 *sqq.*; Fr. F. de Sousa, S.J., *Oriente conquistado a Jesu Christo*, parte I, conq. I, div. I., nn. 16 and 17.

[2] Fr. Sacchini, S.J., *Hist. Soc. Jesu*, p. II, lib. I, n. 51.

[3] [By Christian Doctrine understand throughout the Catechism.]

[4] *Litteræ Annuæ*, 1573 and 1574. [Pyrard de Laval speaks of 2000 pupils in 1610, all educated gratis.]

Alive to its advantages, the Superiors realized from the very beginning the necessity of establishing there a printing-press, not only for the sake of the College and the schools, but also in order the help the numerous Christian communities in formation in the East, by procuring books to the missionaries and to the new converts to our holy faith.

A Spanish Coadjutor Brother, Juan de Bustamante, brought from Europe the material of the first printing press with movable types which appeared in India. It started work in 1556, by printing the philosophical theses for a public disputation of our students.[1]

Though for some time it was of little use for want of a man who could manage skilfully the types and the press,[2] Guttenberg's invention proved most useful by printing books in several Indian languages.

The *Catechism*, composed in Portuguese by St. Francis Xavier for the instruction of the faithful, specially of the children, had been in everybody's hands in manuscript form. In 1577,[3] it came out of the Goa press type-printed: a piece of work which one can fancy was no less useful than remarkable.[4]

Leaving aside the Portuguese books printed in the College of Goa, whenever there is no special reason to mention them, we shall review those printed in other languages, after a brief mention of the services rendered to the Ethiopian Mission by the printing-presses of Goa.

GOA.—ETHIOPIC.—The Mission of Abyssinia or Ethiopia, had long been wished for by the King of Portugal D. João III, by St. Ignatius of Loyola and the Sovereign Pontiffs Julius III and Paul IV, and when, after careful preparations and at the cost of no small sacrifices, it was at last established in spite of great difficulties, it showed extraordinary signs of success. However, though the fruits of it were not to be despised, they were far from corresponding, in the beginning especially, to the high hopes it had called forth and the care bestowed on it.

A mass of trustworthy documents relating to that evangelical campaign has been preserved up to our times. They are now being brought to light under the skilful direction of Father Camillo Beccari, the Postulator General of Causes

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[1] FR. DE SOUSA, S.J., *Oriente Conquistado a Jesu Christo*, parte I, conq. V, div. II, n. 22; FR. CLAUDIO CLEMENTE, *Tables chronológicas..hasta 1642 ..., añadidas hasta 1689 por el lic. Vicente Joseph Miguel, Valencia, 1689*, año 1556, p. 244; FR. SACCHINI, S.J., *Hist. Soc. Jesu*, p. II, lib. I, n. 52.

[2] FR. SACCHINI, S.J., *Hist. Soc. Jesu*, p. IV, lib. V, n. 180, ann. 1577 [1557 ?].

[3] [The year should be 1557. Cf. *Orient Conquistado*, I, 29.]

[4] FELIPE NERI XAVIER, *Resumo historico da .. vida .. de S. Franc. Xavier*, p. I, cap. IX; FR. SOUSA, *Op. cit.*, p. I, conq. I, div. I, n. 23; *Monumenta Xaveriana*, t. I, p. 962.

for the Society, and are received with applause and gratitude by all lovers of history.[1]

The famous Prester John had asked from Europe, clever typographers and artisans of every kind.[2]

This happened probably in 1514 or shortly before. Among the things which the Emperor asked from King D. Manuel "the Fortunate," one was that he should procure him men of learning, versed in sacred lore, skilful typographers and every class of handicraftsmen.

Anxious to win the good will of the Emperor and to reconcile his people with the See of Rome, the magnanimous Portuguese monarch showed himself most liberal. He gave Ruy Leite two long lists of whatever he was to prepare for Prester John, and Lorenzo de Cosmo was entrusted with the care of bringing them to their destination. Besides many other things, Leite was to procure for the Emperor two organs, an organist, and two painters, and the King added: "You shall also take care to look for a printer to go over there."

These two interesting lists, dated July 6, 1514, and January 12, 1515, were published at Coimbra in 1880.[3]

There is no evidence that the artisans asked for were sent to the Emperor. Almost half a century later, they tried to comply with his wishes in another way; for, in 1560, while in St. Paul's College at Goa, the aforesaid Spanish Brother Juan de Bustamante, born at Valencia of the Cid in 1530 and admitted to the Society of Jesus in 1555, joined to the study of Rhetoric the office of Prester John's printer. After completing his studies in Goa, the typographer of Valencia was ordained a Priest in 1564, his death taking place on August 23, 1588.[4]

We possess concerning this first printing-press in India some trustworthy particulars which Father Beccari has just brought to light in his tenth volume, and we proceed to give here a summary of them.

The first batch of Jesuit missionaries embarked at Belem, on the Tagus, and left for Ethiopia on March 29, 1556, four months before the death of St. Ignatius of Loyola. It consisted

[1] Ten volumes in large 4°, accompanied by erudite prefaces and copious indexes have been published under the title *Rerum Æthiopicarum Scriptores Occidentales Inediti a sæculo XVI ad XIX, curante C. Beccari, S.J. Romæ excudebat C. de Luigi*, 1903–1910.

[2] "Industrios typographos et in omni genere artifices." Cf. *Boletim de Bibliographia Portugueza e Revista dos Archivos Nacionaes*, Coimbra, 1880, vol. II, n. I, p. 17.

[3] Cf. *Boletim, Op. cit.*, pp. 18–23. The original lists are at Lisbon, in the "Archivo da Torre do Tombo, Corpo chronologico, parte 1ª, maço 17, no. 75.

[4] Lisbon, MSS. of Ajuda, *Registro de Cartas do Collegio de S. Roque*, t. II, p. 330 *sqq.*, quoted by the *Boletim de Bibliographia*, p. 17.—Catalogues of various years.

of Fr. John Nuñez, Patriarch of Ethiopia; Fr. Andrew de Oviedo, Bishop of Hierapolis, and appointed as successor to the Patriarch; Fr. John Gualdames, three Brothers of the Society, and some young men who were soliciting admission into it. One of the Brothers was Juan de Bustamante just mentioned, who knew the art of printing.

King D. João III, the royal family, and other friends had been munificent towards the members of the expedition. The King adjoined to the Patriarch an Indian of good character, an able and experienced printer, to help Brother Bustamante, who was taking with him a printing-press to Goa. An eye-witness gives us this information.[1]

On reaching Goa on September 6 of the same year 1556, the press was set to work without delay; for, according to a letter of the Patriarch written to Fr. Louis González de Cámara and dated Goa, November 6 of the same year, the Brothers studying Philosophy had had a public disputation, and the *Theses*, or propositions to be defended, had been printed, besides other things, by Brother Juan. He was performing his office well, and they expected he would make further progress.

At the time the Patriarch wrote this letter, there was question of printing the *Catechism* of St. Francis Xavier, a work from which all expected great advantage for the Ethiopian Mission.[2]

One of the books published by Brother Bustamante in 1560, was a treatise in Portuguese, in which Fr. Gonzalo Rodriguez, basing himself on the Councils and the Holy Fathers. established the primacy of the Church of Rome against the schismatical errors of the Abyssinians.[3]

The missionaries of Ethiopia had also tried several times to get their own press in the land of Prester John, for the better management of that Mission. Thus, at the end of the XVIth century, writing in Italian to the Cardinal Protector of the Ethiopian Mission in Rome, they told him: "As we find ourselves obliged to compose many treatises, and distribute a great number of copies of the same, and this cannot be done easily unless we print them, we beg of Your Most Illustrious

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1 *Rerum Æthiopic. Script.*, vol. X, pp. 55–61. Letter of Fr. Gaspar Calaza to St. Ignatius. Lisbon, April 30, 1556.

2 *Ibid.*, pp. 62–67. Letter of Fr. João Nuñez, in Portuguese, Goa, November 6, 1556; another of Fr. Andrew de Oviedo, also in Portuguese, Goa, November 7, 1556. [The Theses were defended by Francisco Cabral and Manoel Teixeira and presided over by Fr. Antonio de Quadros. Cf. Polanco, *Chron. S.J.*, tome VI, pp. 783-784. The Patriarch wrote: "They wish now to print in this College the Christian Doctrine made by Master Francis." Cf. Beccari, *Rer. Ethiop. Scriptores*, t. X, p. 64.]

3 Fr. Gonzalo Rodrigues: born at Calleiros (Portugal) in 1527; went to the Indies in 1551; was a missionary at Goa. Ormuz and in Ethiopia; died at Goa on March 5, 1564. Cf. Fr. Sommervogel, *Bibliothèque de la Comp. de Jésus*, t. VI, col., 1968.

Lordship to send us a press with the Ethiopic types that are found in Rome, as also one or two persons knowing the art of printing."[1]

As the petition was not favourably received, it was renewed by the Patriarch Alfonso Mendez in a letter addressed to the Sacred Congregation de Propaganda Fide. On July 16, 1628, this Congregation answered by asking that the Ethiopian alphabet should be sent in order to have the types cast in Rome and forwarded to the Mission.[2]

Even this time it does not seem that the wishes of the missionaries were realized; for Father Manoel de Almeida, Pedro Páez, Manoel Barradas and Alfonso Méndez, who wrote most accurately and minutely the history of Ethiopia, make no mention of a press in their beloved Mission.

We must, therefore, believe that the Fathers of Goa continued to help their brethren in Ethiopia by printing in Portuguese whatever books were needed for the management of their great undertaking. We know, too, that they had in their possession the Ethiopian types presented by the Congregation de Propaganda Fide for the benefit of the persecuted Ethiopian Mission. When Father Alfonso Méndez, the Patriarch, was driven into exile by the schismatical Emperor, Father Antonio Fernández followed him to Goa. It was there that this Father published in Chaldean with Ethiopic type his *Magseph assetat*, or "The whip against falsehoods," a treatise in which he refutes the errors of the schismatical Raz Athemateot. It was printed in St. Paul's College, Goa, in 1642.

Father Antonio Fernández was born in Lisbon, and after working over thirty years in Ethiopia, he died at Goa on November 12, 1642. Besides his work in Chaldean, he had at the Emperor's request composed others in Armaranic or Ethiopic, and translated other books from Latin into Ethiopic.

Among those which he wrote in Armaranic there was one entitled: "The Life of the Blessed Virgin Mary, Mother of God." The Patriarch translated it into Portuguese, and it was printed in St. Paul's College in 1652.[3]

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[1] *Goana-Malab., Epist. 1580–89*, fol. 2, document 143. The Ethiopic types found in Rome were probably those used in printing a 4° work, about which St. Ignatius of Loyola wrote to Fr. Diego Mirón in Portugal on August 22, 1555: "These last years, during the pontificate of Paul III, of happy memory, while there were here in Rome some learned Abexins and other persons zealous for the spiritual welfare of the kingdom of Ethiopia, they prepared and printed the whole New Testament in the Abexin language, the chief one used in their writings and liturgy." *Monumenta Ignatiana*, Series I, t. IX, p. 487.

[2] Rome, Archives of the Congregation de Propaganda Fide, *Lettere latine*, 1622-1628, vol. I, fol. 178 *sqq.*

[3] Sommervogel, *Bibliothèque*, t. III, cols. 646 and 647; Alegambe and Sotwel, *Bibl. Script. Soc. Jesu*, pp. 71, 72. [A copy of it, which Martinus Nijhoff, the antiquarian of The Hague, priced 250 florins, was sent for description in the beginning of 1912 to M. l'Abbé E. M. Rivière.

Fr. Manoel de Almeida in his *Historia Æthopiæ* is full of praise for Fr. Antonio Fernández, and gives an account of the books which he wrote. It is through this author that we know that Urban VIII sent from Rome to the Patriarch Fr. Alfonso Méndez, the Abyssinian or Chaldean type used for printing "*The Whip against falsehoods.*"[1]

The services rendered by the Ethiopic press extended to the Mission of Angola. From 1617, Fr. Francisco Pacconio, a native of Capua, worked for many years in this impor ant and difficult enterprise. He wrote two Catechisms in Ethiopic, and returning to Portugal died at Lisbon on November 16, 1641.[2]

GOA.—Books in Koṅkaṇī.—To the west of India, along the coast, lies a country called Koṅkaṇ, with a language of its own. Among the missionaries who cultivated this vineyard, was Fr. Michael de Almeida, born at Gouvea (Portugal) in 1607, and received in 1623 into the Society at Goa, where he became Rector and later Provincial. According to some, he died in Salsete on September 17, 1683; according to others, at Rachol on November 16, 1687. [It is easy to make these two statements agree partly. Rachol is within the Salsete district, south of Goa.]

Five booklets composed by him in Koṅkaṇī were printed in Goa in 1658: one is an explanation of the Catechism for Sunday instructions to the people: another contains examples and miracles wrought in confirmation of the mysteries of the faith explained in the Christian Doctrine; the three others contain sermons for the feasts of our Lord, our Lady and the Saints.

The same year 1658, he sent also to the Goa press the *Dictionary of the Koṅkaṇī language* composed by Fr. Diego Ribeiro and enlarged by himself, as also five discourses on the versicle *Exurgens Maria*.[3]

Fr. Diego Ribeiro, for fifty years a missionary in Salsete, died at Goa in 1635. He translated into Koṅkaṇī the *Flos Sanctorum* of Fr. Ribadeneira and had it printed at Goa.[4]

Many other books, also in Koṅkaṇī, issued from the Rachol press, as we shall see presently.

GOA.—"Bramana."—Fr. Sommervogel points out the

For the complete title of the Portuguese translation, cf. E. M. Rivière, *Corrections et additions à la Bibl. de la C. de J.*, fasc. II (Toulouse, 1912), col. 194, n. 2. Mendes says (*ibid.*): "este liuro, que o Padre Antonio Fernandez depois de divulgado em Ethiopia na lingua della, aqui em Goa limou em Portuguez." Letter of Goa, Sept. 30, 1647.]

[1] Bk. X, Ch. XLV, n. 5 of *Rerum Ethiopic. Script.*, vol. VII, pp. 472–477. Fr. Almeida calls the author refuted by Fr. Fernández "Ras Athanateus."

[2] Sotwel, pp. 229, 240; Sommervogel, t. VI, col. 75.

[3] Sommervogel, t. I, cols. 188, 189. At the foot of the title-page: "Goæ, typis Collegii Societatis Jesu, 1658."

[4] *Ibid.*, t. VI, col. 1759.

existence of the following work: "The Pastors' Garden, composed in the Bramana tongue by Father Miguel de Almeida, of the Society of Jesus, a native of Gouvea. With permission of the Holy Inquisition and the Ordinary. Printed at Goa in St. Paul's College of the Society of Jesus Year 1658." 4°.[1]

It is very probable that this was not the only book printed at Goa in this language.[2]

GOA.—THE PROFESSED HOUSE. "BRACMANICO-MARASTA."—It is clear that, for a time at least, there existed a press in the Professed House; for we find that a work by Fr. Stephen de la Croix was printed there in 1634. It consists of two folio volumes, and is in "Brahmanico-Marasta" verse, this language being the dogmatic one used by the litterati

This Father was one of the chief pillars of that Mission. Born at St. Pierre du Bosguérard (Eure) in 1579, he became a Jesuit in 1599 and went to India in 1602. He studied at Goa, became there Master of Novices, Rector of the Colleges of Rachol and Goa, and Superior of the Professed House. He died at Goa in September 24, 1643. He knew to perfection the "Kanarese" [Koṅkaṇī ?] and Marāṭhī languages, in which he composed many books, among others a *Poem of the Passion*, which the Christians sang every Friday of Lent in the Church of Salsette [Rachol], the people coming from many leagues away to hear it. The Father died with the reputation of a Saint.[3]

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[1] SOMMERVOGEL, *Op. cit.*, t. I, col. 189. "Jardim de Pastores, composto em lingua Bramana pello Padre Miguel de Almeida da Companhia de Jesus, natural de Gouvea. Com licença da Sancta Inquisição e Ordinario. Impresso no Collegio de Sam Paul de Goa da Companhia de Iesus. Anno 1658."

[2] [From what has been said above of Fr. de Almeida under "Books in Koṅkaṇī," it is evident that "Bramana" here means Koṅkaṇī.]

[3] *Discursos sobre a vida do Apostolo Sam Pedro. Compostos em versos em lingoa bramana marasta. Empressos em Goa, na Casa Professa de Jesus. Com licença da sancta Inquisição, e Ordinario 1634.* SOTWEL, *ibid.*, p. 749; SOMMERVOGEL, *Bibliothèque*, t. II, col. 1688. In spite of the information at the end of the title, we suppose that the press was that of the College; the necessary material and the workmen were perhaps removed to the Professed House to facilitate for the author the correction of the proofsheets. [There is a copy in the National Library, Lisbon. Cf. PINTO DE MATOS, *Biblio. Port.*; DA SILVA, *Dicc. Biblioth. Port.*—We suggest that this life of St. Peter might be a translation of a Portuguese text of Jerome Xavier's Persian Life of St. Peter. Fr. Alex. de Rhodes writes of Fr. de la Croix: "Entre les autres grands personnages que je trouvai en la maison des peres de la compagnie [à Rachol, Salsete, 1621], j'eus une grande consolation d'y rencontrer le R. P. Etienne Crucius, françois de nation, qui en sa jeunesse étant en Portugal, fut reçu en notre compagnie, et puis envoyé aux Indes, où il a travaillé longues années avec tant de bénédiction, que l'on le tenait pour un des plus illustres personnages de toutes les Indes. Il avait si parfaitement appris les deux langues du pays, la canarine, qui est vulgaire [Koṅkaṇī], et la maraste [Marāṭhi], qui est comme chez nous la latine, qu'il les parlait mieux que ceux mêmes du pays, et avait imprimé plusieurs livres en l'une et en l'autre qui sont estimés de tous; et je vis un fort beau poëme de la

The Professed House of Goa was started in 1585.[1]

VAIPICOTA.—PRINTING IN "MALABAR," SYRIAC AND "KANARESE."—The famous Christians of St. Thomas lived in the mountains of Malabar to the number of about 70,000, following in a more or less adulterated form the faith which they had received from the holy Apostle. They used in their liturgy the Chaldean [Syriac] tongue and, though still addicted to some corrupt practices, they were very anxious to return to the purity of the Roman faith.[2]

The decrees of the first Council of Goa for the extirpation of those abuses were most prudent; yet, the inhabitants of the island of Salsete got astir because certain pagan rites were forbidden to them.[3] Prudence and patience, however, succeeded in calming them down.

Having gained this much, Fr. Alexander Valignano, the visitor of the Missions of India, Japan and China, had an interview with Mar Abraham, the Archbishop of the St. Thomas' Christians. He offered him costly presents and obtained in writing ample facilities for the Fathers of the Society to exercise their apostolic ministry and settle among his diocesans.

A place for a residence was found not far from the fort of Cranganor, in the town of Vaipicota which was subject to the King of Cochin, a friend of the missionaries. A church was built under the invocation of the True Cross, and immediately Fr. Bernardino Ferrão, together with Pedro Luis, a native priest, began in 1577 to compose in the Malabar tongue a small work containing the orthodox Christian doctrine.

The chief difficulty was how to have it printed. In this, as in all the rest, Divine Providence had provided by bringing to Goa the Spanish Coadjutor Brother Juan González.

Received into the Society in 1555, this Brother united to no common sanctity talent, a sound judgment and a rare skill in his office of ironsmith and clock-maker. These qualifications made him most useful to the Ethiopian Mission. He died at Goa in 1579, leaving a sweet remembrance of his virtues.

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passion de Notre-Seigneur que les chrétiens chantaient en l'église sur le soir de tous les vendredis du carême; et la devotion durait une grande partie de la nuit, avec un concours si grand, que de Goa même venaient ordinairement dix à douze mille personnes pour assister à cette belle dévotion." Cf. *Voyages et Missions du P. A de Rhodes*, ch. IV.]

1 SOUSA, *Oriente conquistado*, pt. II, conq. I, div II, n. 105.

2 "Ab his ipsis primis Seleucensibus Patriarchis in Malabariam inter Christianos Thomæos, qui cum illa sede communicabant, invecta fuit vetus *Chaldaica* liturgia, lingua *Syro-Chaldaica*, et antiqui characteres chaldaici, *Estranghelo* dicti." P. PAULINUS A S. BARTHOLOMEO, *India Orient.*, p. 254.

3 [The author seems to confound here the dispositions of the Council against the errors of the St. Thomas Christians in Malabar with those against the superstitious rites of the Hindūs in Salsete of Goa.]

This clever artist contrived the matrices of the "Malabar" types, cast the type, and in a short time the College issued a host of Catechisms, which filled thousands of neophytes with admiration and joy. This Catechism was followed by other publications printed at Goa also in "Malabar." These books, by the fact that the language was common to large tracts of the country, became powerful auxiliaries in spreading the knowledge of religion, besides fostering the growth of Christian virtues to the detriment of heathenism.[1]

The third Provincial Council of India, held at Goa, on June 9, 1589, gave a new impulse to the typographical and editorial movement in Western India. The Archbishop and Primate, Frey Vicente de Fonseca, presided over the Council, assisted by the Archbishop of Angamale, the Bishop of Cochin, his Procurator of Malacca, Fr. Alexander Valignano, Provincial of the Society of Jesus, together with some Fathers and several Prelates of other Religious Orders.

The Council having ordained by its seventh decree the translation into Syriac and "Malabar" of some books required for the proper management of that Christian community, the Fathers of the Society of Jesus were entrusted with the task of carrying out the Council's intentions

The most important step had already been taken, when Fr. George de Castro, after overcoming great difficulties, had established the Seminary of Vaipicota where both these languages, as unlike to each other, says Fr. de Sousa, as English and Greek, were being taught. "Malabar" is the vernacular, and Syriac the Church language.

After mastering these languages at the cost of untold labour, Missionaries were appointed professors of both languages in the said Seminary. At the same time, they had to teach Latin and "Kanarese."[2] This last language was spoken in Kanara, also in the west of the Indian peninsula.

The professors applied themselves to the task, and not only translated from Latin into Syriac a commentary of the four Gospels, another of the Pentateuch, the lives of the Apostles and other Saints, a book on the Sacraments, the office of our Lady, the Ritual and the Catechism of Trent, but composed in "Malabar" a voluminous Prayer-book, a Catechism, and a booklet of devotional exercises for the Sundays and chief feasts.

These publications and the preaching of the Fathers,

[1] Fr. de Sousa, *Oriente conquistado a Jesu Christo*, pt. II, conq. I, div. II, nos. 12, 33; Fr. Sacchini, *Hist. Soc. Jesu*, p. IV, l. V, n. 181; Fr. Paulinus a S. Bartholomæo, *India Or. Christiana*, p. 181; Hovelacque and Vinson, *Etud. de Linguist. et d'Ethnogr.*, May 12, 1876, p. 74. [It is difficult to see why "Malabar" books should have been printed at Goa, and not at Vaipicota or Cochin. I do not believe in the "Malabar" printing of Goa].

[2] [Read "Malabar."]

assisted by the priests educated in the Seminary, confuted the errors of paganism, while the knowledge, love and practice of the true faith spread among the new Christians.[1]

It had been Brother Juan González' intention to make "Kanarese" [Koṅkaṇī ?] type; but, in the end, he gave it up, partly on account of the uncouth shape of the letters, and the difficulty of settling the pronunciation, and partly because the country over which the language was used was very small.[2]

The first difficulty, however, was overcome and several works in that tongue were printed, especially at Rachol, as we shall just see.[3]

RACHOL.—Polyglot Printing.—A man who deserved well of the Christian communities in India was the English Fr. Thomas Stephens. He was born in 1549 in the diocese of Salisbury and was the first English Jesuit to work as a missionary in India.

From Rome, where he was studying, he went over to Salsete, where he became Rector of the College and Missionary. The Portuguese writers call him Thomas Estevão or Estevam; others give him the name of Thomas Busten, Buston or de Bubsten, and some also that of Estienne.

He learnt Koṅkaṇī and Kanarese [Marāṭhī ?] so perfectly that he was able to write in both languages books which he published at Goa and Rachol. He died at Goa in 1619, aged seventy years, forty-four of which he had passed in the Society and forty-one as a Missioner in Salsete.[4]

At Rachol, near [within] the Portuguese fort, a printing-press was working in St. Ignatius' College from 1616 at the latest to 1668. It published books in Portuguese, Kanarese, Malabar, and Syriac.[5]

Here are some of the printed productions of Rachol, as given by Fr. Sommervogel:—

"A discourse on the coming into the world of our Saviour Jesus Christ. Divided into two treatises. At Rachol, in the College of the Society of Jesus, 1616."[6]

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1 Fr. de Sousa, *ibid.*, pt. II, conq. I, div. II, nos. 93, 106.

2 Fr. de Sousa speaks at length of the difficulties special to Kanarese [Koṅkaṇī]. *Ibid.*, p. 64. [The reference is wrong. It might be *ibid.*, p. 106].

3 [Can it be proved that the Jesuit press issued Kanarese or Koṅkaṇī books in the native character before the middle of the XVIIth century or even later ?]

4 He is mentioned among other authors by Fr. Patrignani, *Menologio*, December 15; Fr. de Guilhermy, *Ménologe, Assist. de Germanie, 2e série, 2e partie*, Sept. 19; Fr. Sommervogel, *Bibliothèque*, cols. 468; 469.

5 Fr. Sacchini, *Hist. Soc. Jesu*, p. IV, l. V, n. 180.

6 "Discurso sobre a vinda de Jesus Christo, nosso Salvador, ao mundo, dividido en dous tratados. Em Rachol, no Collegio da Companhia de Jesus anno de 1616." Cf. Sommervogel, *Biblioth.*, t. II, col. 468, art. "Busten"; *Id.*, *Dictionn. des ouvrag s Anon.*, col. 222 [It is altogether unlikely that this—a poem of 11,018 stanzas of four verses each—should

A second edition appeared also at Rachol in 1649, and a third was printed "in St. Paul's College," Goa, in 1654.

It appears to have been written first in Portuguese and then translated into Koṅkaṇī. In the second and third editions it bears the title of "Purana." It is a poem of 11,018 stanzas of four verses each concerning sacred history from the crea-

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have been first published in 1616 in Portuguese. We read in *Lettere Annue del Giappone, China, Goa, et Ethiopia ... anni* 1615, 1616, 1617, 1618, 1619 .... Napoli, Lazaro Scorrigio, M. DC. XXI, pp. 112, 113: "[Fr. Thomas Stephano] was 70 years old, and had lived 54 years in the Society, 40 of which had been devoted without a break to cultivating the Mission of Salsete [Goa], with as much willingness on his part as satisfaction on the part of his superiors. He made himself thoroughly master of the Canarine [Koṅkaṇī] tongue, and reduced it to grammatical method with such profit to ours that, whereas at first no one was able to hear the confessions of those people, he saw his Grammar produce in hi lifetime, like some printing-press, not confessors only, but a host of preachers and writers of books. Not satisfied with this, he applied himself also most diligently to the study of the Industanee language [Marāṭhī], that used by the nobility. And he succeeded so well that, at the instigation of his superiors, he began printing in that dialect a volume of verse on the chief mysteries of the faith, the creation of the world, the fall of our first parents and some of the chief prophecies concerning the advent of Christ. This work is so agreeable that not only do the Christians derive much profit from it, but even the Gentoos pride on speaking of it. On Sundays and feast-days this book—*Purana*, as it is called—is read in Church, with equal fruit and applause. He composed also in that language a Christian Doctrine [Catechism]. It was being printed when the Father was called to a better life; but the fruit, which is bound to result from such a doctrine, will not be posthumous to him there." (Letter of Febr. 1, 1620, Goa.) Fr. Cas. Christovão de Nazareth (*Mitras Lusit.*, 2a Ed., Lisboa, 1897, p. 123), says that a large part of Stephens' *Purāṇa* was printed at Bombay (1825) and Nova Goa (1857), that a Marāṭhī translation was printed in Portuguese characters at Lisbon in 1559 [?], 4to, and reprinted at Bombay, "Asiatic Press," 1876 (pp. II + 144), and that this Marāṭhī *Purāṇa* is still read in Lent in the churches of the North (Bombay). I suspect, however, some confusion with other Catholic *Purāṇas*, e.g.: that of Fr. Francisco Vaz de Guimarães, similar to that of Stephens, which was printed at Lisbon in 1659 in Portuguese characters, at Bombay in 1845, and perhaps again in 1879. A new edition of Stephens' *Purāṇa* was published at Mangalore (1909) by J. A. Saldanha. Cf. E. M. Rivière, S.J., *Correct. et Addit. à la Bibl. de la C. de J.*, fasc. II (Toulouse, 1912), col. 282. Some very interesting articles appeared in that connection in the *Mangalore Magazine*, St. Aloysius College.

Biographical and other notices on the "first Englishman in India" will be found in Ribadeneira, de Backer, Sotwel, Parsons, More, H. Foley. Cf. also Oliver; J. H. da Cunha Rivara, *Archivo Nacional*, Lisbon, IV (No 13, Jan. 1861); —Monier Williams, *Contemp. Review*, April 1878;—F. M. Mascarenhas, *Indian Antiq.*, VII, 117;—Th. Hauser, S.J., *Bombay Cathol. Examiner*, 1875, No. 43;—*Voyage of Pyrard de Laval*, Hakluyt Soc., London, 1890, II, 269-70;—Feller, *Biogr. Univ.*, art. "Buston";—*Dicc. bibl. portug.*, VII, 344;—*Arch. univ*, IV, 229;—*Inst V. Gama*, 1873, n. 24;—*Dicc. pop.*, XIII, 290;—*Imprensa em Goa nos sec. XVI, XVII, XVIII*, pp. 29-43, 93-94;—*Portug. e os estrang.*, II P., Vol. I, 384, 385;—J. Dahlmann, S.J., *Die Sprachkunde und die Missionen*, Op. cit;—*Mangalore Magazine*, first three vols. passim;—Dr. G. A. Grierson, *Linguistic Survey of India*, VII, p. 167.]

tion of the world up to Our Lord's Ascension. In 1785, the Christians, who suffered martyrdom under Tippu Sahib, were comforted by the reading of this book.

"Christian doctrine in the Bramana-Canarim tongue, in the form of a dialogue for the teaching of young children. Rachol, 1632," by Fr. Stephens. It is, perhaps, a translation of Fr. Ignatius Martins' booklet: "Cartilha da Doutrina Christaa."[1]

"Explanation of the Christian doctrine, compiled from Cardinal Robert Bellarmine,..and other authors, and composed in vernacular Bramana by Father Diogo Ribeiro.. Printed in St. Ignatius' College of the Society of Jesus, Rachol. Year 1632."[2]

"Jesus, Mary. The Art of the Canarim language, composed by Fr. Thomaz Esteuã of the Society of Jesus, and enlarged by Fr. Diogo Ribeiro of the same Society. Newly revised and corrected by four other Fathers of the same Society. With permission from the Holy Inquisition and the Ordinary. Rachol, in St. Ignatius' College of the Society of Jesus, 1640," by Fr. Thomas Stephens.[3]

Several other Fathers mastered the languages of the country, and preached and wrote in them.

The Neapolitan, Fr. Leonardo Cinnamo, or Cinami, joined the Society in 1623 when he was yet but a lad. He had such a decided vocation for the Indian Missions that he bound himself by vow to solicit them. His wish having been gratified in 1644, he wrought wonders of zeal in Kanara, and later on during twenty years in Salsete and other parts.

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1 "Doutrina Christã em lingua Bramana-Canarim, ordenada á maneira de dialogo para ensinar os meninos. Rachol, 1632." Cf. *Biblioth.*, cols. 468; 469; *Anon.*, col. 241. [The date "1632" should be corrected to 1622. Cf. E. M. Rivière, *Corrections et Addit. à la Bibl. de la C. de J.*, fasc. II, Toulouse, 1912, col. 282, n. 5. It is the translation of the *Cartilha* by Fr. Marcos Jorge, since de Sousa (*Oriente Conq.*, Pt. I, p. 29) says that the work of M. Jorge superseded the Catechism of St. Francis Xavier at Goa. Editions of it had appeared in Portugal in 1561, 1566, 1609, 1614. Fr. Ignatius Martins, a Jesuit between 1547-1598, enlarged it, and these additions are found in several editions of Fr. Jorge's *Cartilha*.]

2 "Declaraçam da Doutrina Christam, collegida do Cardeal Roberto Belarmino .. e outros autores, composta em lingoa Bramana vulgar pello Padre Diogo Ribeiro .. Impresso no Collegio de Sancto Ignacio da Companhia de Jesu em Rachol. Anno de 1632." Cf. *Biblioth.*, t. VI, col. 1759.

3 "Jesu Maria. Arte da lingoa Canarim composta pello. Padre Thomaz Esteuã da Companhia de Jesus, e acrecentada pello P Diogo Ribeiro da mesma Companhia. E nouamente revista e emendada por outros quatro Padres da mesma Companhia. Com licença da S. Inquisiçam e Ordinario. Em Rachol no Collegio de S. Ignacio da Companhia de Jesus, anno de 1640." Cf. *Biblioth.* t. II, col. 469; *Anon.*, col. 443; also *Biblioth.*, t. VI, col. 1759. "A. Vocabulario..." [This is a Koṅkaṇī Grammar, which was reprinted by J. H. da Cunha Rivara at Nova Goa in 1857.]

India is indebted to him for a most complete "*Catechism of the mysteries of the Faith,*" a compendium of the Christian Doctrine in elegant Kanarese, for the instruction of the neophytes, as also for sundry *Lives* of Saints and an *Apology* of the mysteries of the faith, with a refutation of pagan sects and superstitions. Availing himself of his deep knowledge of Kanarese, he also composed a Dictionary and a Grammar.[1]

Fr. João de Pedroza born at Coimbra in 1616, and received into the Society in 1631, had also completely mastered Koṅkaṇī, a language in which he preached with rare eloquence. During more than sixteen years his zeal filled Salsete with admiration. He was Rector of the College of Rachol and of the Novitiate of Goa, where he died in the Professed House on May 12, 1672. He wrote a book of Soliloquies of the Soul with God, and an Instruction about making a good confession.[2]

Though of Portuguese extraction, Fr. Antonio de Saldanha was born at Mazagán (Africa) in 1598. He proceeded thence to the Indies to try and make his fortune in the military profession. But God called him to another sort of warfare. Faithful to the promptings of grace, he entered the Novitiate of Goa in 1615. During forty years he devoted himself to the Salsete Mission and died at Rachol on December 2, 1663. He wrote several books in the "Bramana" tongue, which were printed at the Rachol press.[3]

PUNICAEL.—Tamil Printing.—Fr. João de Faria was labouring strenuously on the Fishery Coast, contending, like the rest of the Missionaries, with the lack of men and books written in the vernacular. In 1578, prompted by his zeal, he contrived to engrave on wood the characters of the Tamiḷ language. Four years later, in 1582, he died at Goa and went, we hope, to receive the reward of his labours.

The press of the Fishery Coast was working at Punicael in 1578, since a *Flos Sanctorum* or Lives of the Saints was printed there that year in Tamiḷ types.[4]

Fr. de Sousa adds that Fr. de Faria not only engraved but cast Tamiḷ type, "with which were printed this year [1578] the *Flos Sanctorum*, the Christian Doctrine, a copious Confessionary [or Prayer-book], and other books in which the Missionaries learned how to read and write. Those countries were marvelling at the new invention, and pagans as well as

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[1] Sotwel, pp. 548; 549; Sommervogel, t. II, cols. 1187 and 1188.

[2] Sotwel, p. 486; Sommervogel, t. VI, col. 419.

[3] One of them, though written in "Bracmana" bears this title: "Tratado dos Milagres, que pelos merecimentos do Glorioso Sancto Antonio .. foy Nosso Senhor servido obrar .. No Collegio de Rachol. 1665." Sotwel, p. 84; Sommervogel, t. VII, cols. 459; 460 [where the date is 1655].

[4] Sommervogel, *Biblioth.*, t. III, col. 545; t. VI, cols. 1241; 1242

Christians tried to obtain these printed books and prized them highly."[1]

AMBALACATA.—TAMIL, BADAGA AND "MALABAR" PRINTING.—After this first step, it became easy to print other books which proved not less useful to the faithful than to the Missionaries.

A work which deserves a special mention is the "Tamil Vocabulary with the meaning in Portuguese, composed by Fr. Anthony de Proença of the Society of Jesus, a Missionary in Madura. Ambalacata, 1679." The author, Fr. Proença. was born at Ramella in 1625, entered the Society on July 13, 1643, went to the Madura Mission in 1647, and died at Tociam on December 14, 1666.[2]

For the composition of this great work, Fr. Proença availed himself of the labours of Fathers Ignatius Bruno, Robert de Nobili and Manoel Martins. His *Vocabulario* was further revised by Fathers Anthony Pereira, Valerian Catáneo, John de Maya and other Missionaries well up in the language of the country. At the end of the book there is a Tamil Grammar arranged by Fr. Balthasar da Costa.

The printer was a native, Ignatius Aichamoni. Though the types engraved by Aichamoni were elegant, they got worn out by constant use and owing to the softness of their material, wood, as we have said.[3]

Many are the writers who speak of the extraordinary merits of Fr. Robert de Nobili, whom we have just mentioned. He was born in Rome in September 1577, and received into the Society at Naples on June 15, 1596. In 1606 he began his heroic labours in Madura, and carried them on for forty years, his zeal and austerity making him adopt an extraordinary mode of life.

He had a great command of the three languages most current in the country, Tamil, Badaga and "Malabar." He wrote and published many books in them, chiefly during the last five years of his life, which he spent in retirement at Jaffna and Meliapur, dying at the latter place on January 16, 1656.

We find that one of his works, the *Candam* or Christian Doctrine, in four volumes, was printed at *Tragambar* [Tranquebar].[4]

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[1] *Oriente conquistado*, pt. II, conq. II, div. II, n. 3.

[2] FR. FRANCO, S.J., *Imag. da virt. em o novic. de Evora*, p. 661; ID., *Ann. glor.*, p. 738; FR. PATRIGNANI, *Menologio*, Dec. 10; FR. GUILHERMY, *Ménologe.—Assist. de Portug.*, t. II, Déc. 27; SOMMERVOGEL, *Biblioth.*, t. VI, col. 1241.

[3] FR. DE SOUSA, *Oriente conquistado a Jesu Christo*, pt. II, conq. I, div. II, n. 69; FR. PAULINUS A S. BARTHOL., *Ind. Or. Christ.*, p. 182; ID., *Examen hist.-critic. Codicum Indicor. de Prop. Fide*, Romæ, 1792, p. 55; SOMMERVOGEL, *Biblioth.*, t. VI, cols. 1241; 1242.

[4] SOMMERVOGEL, *Biblioth.*, t. V, cols. 1779; 1780; SOTWEL, pp. 724; 725; FR. PAULINUS A S. BARTHOL., p. 192.

COCHIN.—"MALABAR" PRINTING.—A small book on the Christian Doctrine composed in Portuguese by Fr. Marcos Jorge [1] and translated into "Malabar" by Fr. Henry Anríquez [Henriquez], was printed at Cochin in the College of the Mother of God on November 14, 1579. Fr. Manoel Martins had it printed in Tamiḷ, but we do not know where [2]

We do not know either how long that press was active.

Fr. Sommervogel gives in Latin from Sotwel the different works written by Fr. Anríquez or Henríquez in Tamiḷ,[3] or in the "Malabar" tongue spoken along Cape Comorin. Fr. Anríquez was born at Villa-Viciosa about 1520 and died at Punicael on February 6, 1600.

ANGAMALE AND CRANGANOR.—CHALDEAN PRINTING.—Fr. Francis Roz was the father and protector of the Malabar Mission. Born at Gerona in 1557 and received into the Society of Jesus in 1575, he embarked for India in 1584 and, after zealously labouring as a Missionary in Malabar, was appointed Bishop of Angamale on January 25, 1601.

This loving Prelate devoted all his cares to his beloved flock. After making the tour of his diocese, he convoked a Council at Angamale, and, seeing the grievous errors made in the liturgy, he took in hand the reform of the ecclesiastical books. By order of Pope Clement VIII, Fr. Albert Laerzio brought from Europe Chaldean types in order to supply the clergy at once and plentifully with the necessary books. The most important was the Roman Ritual, translated from the Latin, which was sent to all the priests that they might administer the Sacraments according to the Canons. This was followed by other books for the celebration of the divine offices and religious ceremonies and for the instruction of the clergy.

As the town of Angamale lay open to the attacks of some petty heathen kings, the see was transferred to Cranganor in 1609, Fr. Roz being nominated Archbishop of the place by Pope Paul V. The zealous prelate ended his days at Parur on February 16, 1624.[4]

We shall close this complicated subject of the Indian printing-presses by making an honourable mention of an eminent Missionary, a great linguist and prolific writer: Fr. Joseph Constantius Beschi, born at Castiglione (Venice) on November 8, 1680, and admitted into the Order of St. Ignatius on October 21, 1698.

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[1] SOMMERVOGEL, *Biblioth.*, t. IV, cols. 821; 822.
[2] *Ibid.*, t. IV, col. 822; t. V, col. 651.
[3] *Ibid.*, t. IV, cols. 276; 277.
[4] JOUVANCY, *Hist. Soc. Jesu*, parte V, t. II, lib. XVIII, § 5; SOTWEL, p. 249; SOMMERVOGEL, *Biblioth.*, t VII, cols. 263; 264; DE SOUSA, *Oriente conquistado*. pt. II, conq. I, div. II, n. 93; PAULINUS A S. BARTHOL., *India Orient. Christ.*, pp. 63; 64.

He studied in Rome with extraordinary success Hebrew, Greek, Latin and Portuguese, besides Italian, hoping all along to be selected for the Indian Missions.

While in Madura, he applied himself with advantage to Saṁskṛt, Telenga [Telugu]. and especially Tamiḷ. After five years he had thoroughly mastered Tamiḷ grammar and poetry. He spent the next twenty years reading the chief books in that language. The Raja of Tritchirapalli [Trichinopoli] made him his Prime Minister.[1] This remarkable polyglot died at Manapad about 1746, leaving after him, edited or in manuscript, a great number of works in prose or in verse.[2]

Besides Fathers Busten [Stephens] and Beschi, there were in India other European Missionaries who clothed the sublimity of their religious and moral teaching in the attractive garb of poetry and the grace of sonorous rhythmical cadence, thus stirring up not only the intellect, but the will and the imagination of their neophytes. The Life of Our Lady composed in Tamiḷ verse by Fr. Robert de Nobili was sung in many places by all classes of the people.

We shall not even try to mention the many countries of India won over to the Catholic Church by the Missionaries during the XVIIth and XVIIIth centuries, with which we are chiefly concerned, nor the excellent fruits of holiness which Christian India produced, thanks to the ministers of the Gospel, assisted by the printing-presses created by them.

The eloquent testimony which we find in the first *History of the Jesuit Missions in India, Ethiopia and Japan*, written in Portuguese, apparently by Fr. Manoel Teixeira, is worth many others. In the second part. chapter VIII, this eye-witness of the events says :—

"The Father Patriarch, João Nuñez, Fr. Francisco Rodriguez and Fr. Antonio de Quadros composed also this year 1557 a Confessionary [or Prayer-book] which was of great utility throughout India. As they had it printed, the Portuguese and the [native] Christians were by its means rescued from much ignorance ; they learned their obligations, what was permitted and what was sinful, and the way of purifying their conscience by confession.

"From that time to this very day it is in everybody's hands in India, to the great advantage of the faithful and of confessors. As a rule, all know how to make a good confession.

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[1] [This is generally recognized as merely a native legend. Cf. J. BERTRAND, S.J., *La Mission du Maduré d'après des documents inédits*, IV. 16 ; and L. BESSE, S.J., *The Examiner*. Bombay, 1909, p. 436.]

[2] SOMMERVOGEL. *Biblioth.*, t. I, cols. 1402-1409. [The completest bibliography of Fr Beschi is by JULIEN VINSON, *Revue de Linguist. et de Philol. comparée*, Paris, Vol. XXXIX, pp 123-146 ; Vol. XL, pp. 1-45. Prof. Vinson throws doubts on Beschi's knowledge of Telugu.]

This Prayer-book, in fact, brought about a great change among the people.''[1]

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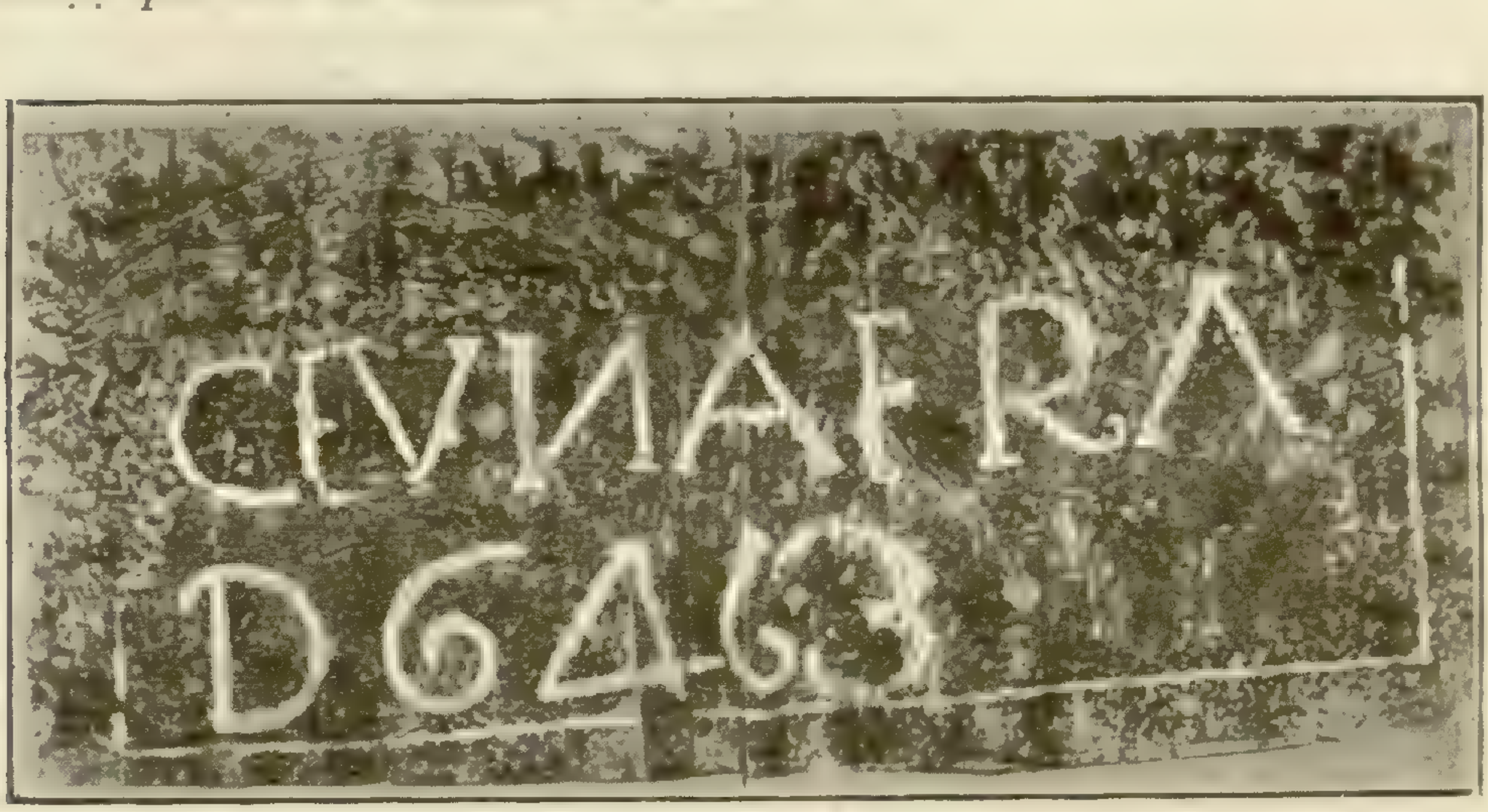
[1] [The present paper, excellent in itself, raises several important and difficult questions which I shall discuss at length in a separate article.—*H. Hosten, S.J.*]

16. Two Portuguese Inscriptions in the Kapaleśvara Temple of Mailapur (Madras).

By Rev. H. Hosten, S.J.

Dr. J. P. Vogel sent me from Lahore on April 12, 1912, estampages of two inscriptions from the Kapāleśvara Temple at Mailapur. They had been sent him by the Archæological Department, Madras, in the belief that they were fragments of Dutch inscriptions; but it did not require much study on Dr. Vogel's part to convince him that they were Portuguese.

Inscription No. 1 was found on the floor of the front *mandapam* of the Amman shrine.



The first line is to be read thus:

[fale–]

CEV · NA · ERA. (=died in the year).

The second line is more puzzling. The following combinations suggest themselves :—

1. Since the last figure is a 3 followed by a full stop, it might seem that the date is [1] 463. It was a common practice among the Portuguese to omit in their dates the figure for the thousands Nowadays we push the practice further, and omit currently even the hundreds, regardless of the perplexities which we shall evidently cause to future historians. The date 1463 is, however, unlikely on more grounds than one. I am told by a distinguished archæologist in Europe, who wishes his name to remain unknown, that Portuguese inscriptions of the

XVth century are in Gothic, not in Roman characters Even should an exception to this rule have been made, there would remain the astonishing fact that a Portuguese inscription of Mailapur would antedate by 38 years the arrival of Vasco da Gama off Calicut (May 20, 1498). In the light of history, this would not be entirely repugnant. We have on record the visit to Mailapur of Marco Polo (1293); of Giovanni da Montecorvino (1292-93), one of whose companions, Niccolo da Pistoia, a Dominican, died there; of Giovanni de Marignolli (1349). and Niccolo de' Conti (1425-30). In fact, intercourse between Europe and India was not so rare in the XIIIth and XIVth centuries as is commonly supposed, and we must not imagine that the Venetians and the Genoese were the only Europeans who traded with India or visited it in the XVth century.[1] Anyhow, a Portuguese inscription at Mailapur at such a date is in itself highly improbable. What might mean, besides, the two first letters in the second line? D[e] G[ratia] = of grace, would be epigraphically unusual, and so would D[e] C[hristo]. Moreover, the second letter (2nd line) cannot be a C, since we have a C of the usual type in CEV (1st line).

Hence, if any simpler explanation can be devised, it ought to be preferred.

2. Could the second line mean D [e] [1] 6 & 63? This would not be unusual in Portuguese epigraphy; but the central character in the second line is clearly a 4.

3. Only one explanation is left, the one proposed by my friend in Europe. The second line must be read, D [e] [1] 646·, leaving out the figure 3. The date was originally [1] 643, but this was corrected later. As the 3 is fainter than the other figures, there must have been an attempt at obliterating it, and the second 6 seems from its cramped appearance to have been squeezed in between 4 and 3. The full stop after this interpolated 6 is significant. It would seem then that the inscription was made considerably later than the date of burial, since the date first recorded was three years too early.

This explanation, it is hoped, will be found satisfactory. It places the inscription in modern times, while the political

[1] About 1893 two tombs of Franciscan Missionaries of the XIVth century were discovered at 2 leagues from the town of Ling-tsing-tcheou, Chang-tong, China. On one of them could be read the name of Bernard. Bl. Oderic de Pordenone had a companion of that name, whom, on his journey through that place, he left to direct its important Christian settlement. The other tomb was that of a Franciscan Bishop, whose name could not be deciphered. The stone was erected in 1387. A MS. contained in a wax-sealed bottle found in the tomb turned to dust on being touched. However, there was found in the same tomb a small bronze box containing a bishop's ring and pectoral cross, on which was engraved the seal of St. Francis. Considering their shape, these two episcopal insignia belonged to the XIVth century. Cf. *Compte-rendu des séances de la Soc. de Géogr. de Paris*. Janv. et Fevr. 1893. Art. of M. Romanet du Caillaud.

troubles so frequent in the neighbourhood of Mailapur would account for its removal to a Hindū temple.

In the Museum of Diu (cf. *Archeologo Portug.*, viii, 183) there is an epitaph with the words ...NA ERA A.D. 1667, where the word A[nno] is redundant after ERA. In the Mailapur inscription there was no room for A [nno], as is plain from the regular outlines of the stone shown on our plate. Hence D = D[e].

Inscription No. 2 was found on the floor of the Kalyāṇa *maṇḍapam* of the Kapāleśvara Temple. It is in Portuguese, too, and runs thus :—

E · DE SEVS · HE
RDEIROS (=And of his heirs).

The shape and the spacing of the letters go to show that this fragment does not belong to No. 1. Moreover the breadth of the two stones differs considerably. It is from 60 to 61 inches in No. 2 ; 74 inches in No 1.

Since fragments of Christian funeral inscriptions have been worked into the floor of this Hindu temple, it is not impossible that there be other fragments with their faces turned downwards. We hope that the Archæological Department of Madras will do the needful to examine into the matter.

17. Two Letters of Major James Rennell.

By Rev. W. K. Firminger, B.D., F.R.G.S.

Mr. T. D. la Touche prints as an appendix to his *Journals of Major James Rennell* (*Memoirs of the Asiatic Society of Bengal*, Vol. III, No. 3, pp. 95—248) a letter of Rennell's which I came across in 1910 when inspecting the proofs of some printed and unpublished records of the Comptrolling Council of Revenue at Murshidabad. Last year, while studying the Consultations of that Council preserved at the Record Department of the India Office, I came across the two following letters written by Rennell in the year 1771. I have copied them from the Consultations on which they were entered by the Secretary—doubtless some young English civilian, a lad in his 'teens, who has made a mess of Rennell's spelling and even given "Thos" instead of "Jas" as part of the signature.

In the Major's map of Bengal, reproduced in Mr. D. la Touche's Memoir, the spelling of the following places mentioned in the letter is as follows:—

In the letters—	In the map—
Beluchy	Beleuchy.
Radshy	Raujeshy.
Pucharyah	Pookareeah.

"Mustan Ghurr" is, I take it, Mustangur marked on the map as on the road between Seebgunge and Seerpore (Sherpur in Bogra District). Mustanghur may be identified with Mahāsthān, the ancient capital of the Pods. This identification suggests points of great historical interest.

Comptrolling Council Revenue, Murshidabad.
Consultation, 14th Feb. 1771.

To Samuel Middleton, Esq.,
Chief of the Comptrolling Council of Revenues.

Beluchy.
10th Feb., 1771.

Sir,

I think it is my duty to inform you that there is now in this part of the country a large body of fakirs who are laying all the principal towns under contribution. They were yester-

day at Lutchinpore, 4 coss from this place; and, after receiving two hundred rupees from the Gunge Darogha, marched southwards into the Pucharyah districts. By the accounts I have from an intelligent person, whom I sent to watch their motions, they are about a thousand in number and tolerably well armed. They came from the western provinces about a month ago, and traversed the Dinagepore and Goragaut districts in their way.

As there is no force in this part of the country, I imagine they will continue in it till they have plundered all the principal places. I have met several of their detached parties, which are indeed scattered over the whole provinces of Radshy and Goragaut. I have enclosed a route to this place and a sketch of the country, in case you may think proper to send any force after these miscreants. The country hereabouts is so entirely intersected by rivers and nullas that there is scarce any possibility of travelling with guns.

I am, etc.,

JAS. RENNELL.

Consultation's Do., 7th March, 1771.

The Chief lays before the Board the following letter from Capt. Rennell:—

To SAMUEL MIDDLETON, ESQ.,

Chief of the Comptrolling Council of Revenues.

SEERGUNGE.

1st March, 1771.

SIR.

I have the pleasure to inform you that I joined Lieut. Taylor's Detachment the 24th ultimo and followed the route of the fakirs towards the Hoannah districts, they retreating that way on hearing that they were pursued. Lieut Feltham, with the Rungpore Detachment, taking the road to Goragaut and Gobingunge, surprised their camp in the morning of the 25th, and after a short skirmish defeated and dispersed them, taking their camp and baggage and a few prisoners. Their Chief, Sheik Mun Jenoo, fled on horseback to Mustan Ghurr (a dirgah), where he was joined by about 150 of his followers, all disarmed and many of them wounded. The rest to the number of 2500 are dispersed in such a manner that two of them cannot be found together, so that it is impossible to pursue them with the sepoys. They all throw away their arms in their retreat, and the villagers falling on them killed great numbers.

I marched to Mustan in hopes of taking the Chief prisoner, but on my arrival found the place empty, and was informed that he went off with a few followers on the road towards

Purnea. Upon this I sent a Jimautdar's party after him with orders to follow his route four or five days' journey ; and I am in hopes that the Jimautdar will be successful, as Mun Jenoo is diseased and cannot travel fast.

We picked up provisions in our march which, together with that taken by Lieut. Feltham, shall be sent to Moorshedabad.

As it is probable that some of the fakirs dispersed over these districts may unite again and commit depredations, I have directed Lieut. Taylor to remain at this place with 45 sepoys, which, together with the party under the Jimautdar, make one complete company. The other company is to return to the City, as soon as they have refreshed themselves, for which I have allowed them four days.

I wrote to the Supervisors of Dinagepore and Purneah to inform them of the event, that they may take measures for intercepting any parties that may retreat through their provinces. As Mun Jenoo is an inhabitant of Morampoor, I suppose he will endeavour to retreat to that country.

As Mr. Grose has occasion for the sepoys under Lieut. Feltham, I have directed that officer to return to Rungpore.

I must beg leave to mention to you the behaviour of Lieut. Feltham, whose bravery and vigilance have contributed so much to the success of the expedition.

As the service on which I was sent is now finished, I have left the command to Lieut. Taylor, and shall return to the business which I was before employed on.

Having examined the hill and dirgah of Mustan Ghurr, I think it my duty to inform you that its natural strength, together with a small portion of harbour on the side of the faquirs, will make it any time tenable against a strong detachment, the hill being in most places extremely steep and skirted with thick woods. The dirgah there affords a pretence to the faquirs to assemble, and at the fair which is held in December they are furnished with arms of all kinds, and commonly sally forth from thence 2000 strong. This in particular has been the case last year.

I am, etc.,

JAS. RENNELL.

The service in question having been successfully accomplished, the Chief acquaints the Board that he has recalled Lieut. Taylor's party, and begs leave to recommend, in consequence of the account Capt. Rennell gives of the drigah of Mastangur, that a small party of sepoys be now thrown into it and kept continually stationed there in order to discourage the future rendezvous of these banditti.

18. Sarcocolla.

By David Hooper

(With Plate VI.)

Sarcocolla is the name of an eastern drug remarkable for its supposed virtues in agglutinating wounds, hence the name by which it is known to Europeans is derived from two Greek words signifying "flesh glue." In Persian it is called Kun-judah or Gunjidah, and in Arabic Anzarut or Unjeroot. Guzar is the common name of the drug in the Bombay market.

Early writers recognize the origin of the drug to be a spiny shrub growing in Persia and Arabia. Mir Muhammad Husain (1771) in Makhzan-ul-Adwiya informs us that Unzeroot is the gum of a thorny tree called "Shayakeh" which is about six feet high; it has leaves like those of the frankincense (pinnate), and is a native of Persia and Turkistan. Dr. J. E. T. Aitchison[1] was informed that Anzerut was collected from bushes called "Chir-kah" and "Shia-a-kah"; very common near Kein, Birjand and Yezd, and also not far from Turbat-i-Haidri in Persia.

In 1908, Major (now Sir) P. Z. Cox, H.M. Consul at Bushire, very kindly undertook to collect for the Reporter on Economic Products, some actual plants yielding Sarcocolla. This was ultimately accomplished by the kind offices of a Persian friend of his, who had been trained as a doctor. The places in which the Anzerut or Gunjidah bushes grow are in the hot region of the province of Fars at Firozabad, Fassa, Gawan, Istabbarat, the Shiraz mountains, and beyond Saadi. Small leaves and flowers appear on the shrubs in the spring, and in October dry white pods are found. The trees are not allowed to grow to a great size because the branches are cut off and taken away as fuel. The gum forms on the twigs and branches, and is collected in July during the wheat harvest. There is a peculiarity regarding the production of this gum. The villagers say that small worms come out from the stalks of the bushes and spin webs in which there gradually forms a mass of gum which afterwards dries and consolidates. It is said that the more frequently it is removed the whiter the gum becomes.

The plants collected for Sir P. Z. Cox were forwarded to Kew, and identified as *Astragalus fasiculifolius*, Boissier, Flora Orientalis, No. 484. Natural order, Leguminosæ.

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[1] Pharm. Journ., Dec. 11, 1886, 468.

This species is described as a tall shrub with long white hoary tomentose spines. The flowers are shortly pedicelled. Calyx adpressed, tubular, opening with five lanceolate, subulate teeth. Vexillum oblong. Pod as large as a grain of rice in the husk, covered with a tomentum of white, cotton-like down, consisting of long simple hairs matted together; some of the pods are abortive and full of gum. Seed vetch-like, diameter $\frac{1}{8}$ in.; when soaked in water it swells and bursts and a mass of gum protrudes.

Dymock described the plant in 1891 in "Pharmacographia Indica" as *A. sarcocolla*. Aitchison in 1892 considered it premature to determine it as a new species as in all probability, he said, it would be found to be a species described by Bunge or Boissier. This supposition has been confirmed.

It is remarkable that some writers have attributed the source of sarcocolla to species of Penaea as *P. mucronata*, *P. sarcocolla* and *P. squamosa*, plant from Ethiopia and Cape of Good Hope. The source of this peculiar error is indicated in Dr. Ainslie's Materia Indica, who refers to an account of the (Penaea) plant in the "excellent Edinburgh Dispensatory" by Dr. Duncan, Junior.

Dr. Aitchison refers to *Microrhynchus spinosus*, Benth., another Persian plant, of the composite order, as the origin of false Anzerut, a substance having a most nauseous and offensive odour.

The drug consists of spongy light yellow gummy or resinous grains, from the size of a pea to a sandy powder. It has the appearance of crushed resin, bread crumbs or a form of brown sugar, but more irregular. The tears are whitish, yellowish or red; the whitest being the freshest is preferred, sometimes they are agglutinated but generally they are distinct. The drug has no odour. The taste is sharp and sweetish, followed by a nauseous and disagreeable bitterness. The gum softens in the mouth and dissolves almost entirely in water. The portion insoluble in water contains numerous bundles of woody tissue of uniform size and shape.[1]

Sarcocolla was known to the Arabian physicians of the tenth century who supposed it to have virtues, applied externally, in curing wounds, and placed it among their Yabisant Keroub (Epolutica). Mesuë [2] (died 1015) says of it, "purgat pituitam crudam, et alios humores crassos"; Avicenna [3] (980—1037) speaking of it says, "vim habet sini mordacitate glutinandi; et carnem gignit; inflammationes omnes mitigat, more

[1] A sample of the gum from the Lahore bazar was attacked by insects. These were identified as *Lasioderma testaceum*, Redt. and *Trilobium ferrugineum*, Fabr.

[2] Mesuë, Simp. l. ii, c. xviii, 69.

[3] Canon Med. lib. ii, tract ii, 36.

emplastri imposita.'' The Arabian physicians gave sarcocolla to the extent of two drams, Schroder not more than one dram. In Ulfaz Udwiyeh sarcocolla is classed as "caustica" with blue vitriol, verdigris and burnt wood. and 'cicatrizantia" with red lead and native antimony. To sum up its medical properties: it was employed as a laxative and purgative abortive; for curing pimples, bad wounds, cancer; it was good for neuralgia and sciatica, intestinal worms, removing stoutness and obesity, and for most diseases of the joints and limbs.

Sarcocolla is a Moghul medicine and is used specially by Yunani physicians throughout India. Tavernier [1] (1665) mentions it as one of the drugs obtainable in Surat, a large emporium in the seventeenth century. Dr. Ainslie (1826) records it as a Madras drug. Dr. R. H. Irvine includes it in a catalogue of drugs of Ajmeer [2] in 1841, and of Patna [3] in 1848. Dr. Honigberger [4] states in 1852 that it was officinal in Lahore, where also Baden Powell collected and described it in 1868. The Indian Museum possesses specimens from Bombay, Delhi, Amritsar and Lahore. In Europe, according to Pomet,[5] it was known in 1694 as a medicine from Persia; and Guibourt[6] describes it, probably as a Museum specimen, in 1849. The only official recognition in Europe of sarcocolla appears to be in "Pharmacopoea Hispanica et Lusitanica", edited in 1822.

The modern uses of sarcocolla in Persia are for adulterating opium, for securing the corks of large glass flagons in which rose-water is exported, and it is eaten by ladies of the harem to improve their appearance and to give the skin a gloss. There is no secret regarding the admixture of opium with this gum, in fact it appears to be a recognized ingredient. Opium for home consumption in Persia is prepared by mixing some 20 per cent. of other ingredients with "Schire" opium boiled down to five-sixths of its original quantity. The principal ingredients used are sarcocolla, or an extract from dried poppies, or the seed of the wild rue. The mixture is slowly boiled and constantly stirred and made into sticks known as Teriak-i-lub; this preparation sells at 250 m. per seven pounds.

Professor Joseph Feil of Ohio, reported[7] in 1908 the presence of sarcocolla as an adulterant of tragacanth, a medicinal gum obtained from other species of Astragalus, also growing in Persia. Professor Feil experimenting with a sample of powdered tragacanth, quoted at a low rate, found it to be partly soluble in alcohol, and to have the odour and taste of

1 Travels. Vol. II, p. 20.
2 Topography of Ajmeer.
3 Materia Medica of Patna.
4 Thirty-five years in the East.
5 Histoire Generale des drogues, Paris.
6 Histoire naturelle des drogues simpl.
7 Bulletin of Amer. Pharm. Ass., 1908, 379.

liquorice. In short it had the characteristics of sarcocolla which had been accidentally or fraudulently mixed with the imported tragacanth. Daniel Hanbury on the 27th October, 1870, made a note to the effect that sarcocolla was offered for sale as mastic in the London market.

Gum sarcocolla is imported into Bombay from the Persian Port of Bushire in bags which contain two hundredweights. Dr. Dymock observed that from twelve to twenty bags could be seen in a single warehouse. The total quantity imported must be considerable, and as the foreign export is trifling, the consumption of the gum in the country must be very large.

The chemistry of sarcocolla is of great interest. It was examined by Pelletier of Paris [1] seventy-seven years ago, who separated, by means of alcohol, a substance called sarcocollin. Sarcocollin is described as a brownish, semitransparent, amorphous mass with a sweetish and afterwards bitter taste. It is soluble in cold water and alcohol, but not in ether. If softens when heated, and finally burns away with the odour of caramel. without leaving any residue. The body resembles glycyrrhizin, and it was composed of 57·13 per cent of carbon, 8·34 per cent of hydrogen and 34·31 per cent of oxygen. According to Johnston [2] sarcocollin is a mixture of various resins which may be separated as lead salts.

A sample of Ganjideh from Bushire had the following composition :—

Moisture	10·0
Sol. in spirit 90%	74·0
Sol. in water	5·3
Insoluble fibre	8·4
Ash	2·3
	100·0
Nitrogen	·44

The alcoholic extract was pinkish in colour, brittle and transparent, soluble in water, but insoluble in ether and chloroform. The aqueous solution was neutral in reaction, sweetish in taste and frothed when shaken. With sulphuric acid the dried extract gave an orange solution passing to red and purple; with nitric acid it turned yellow. It contained no nitrogen. Hydrolized with dilute sulphuric acid it yielded 73 per cent of a resinous insoluble product and 26 per cent of sugar. Sarcocollin, or the alcoholic extract of sarcocolla, has therefore the properties of a glucoside. A combustion of the absolutely dried and ash free extract gave the following percentage composition, which agrees closely with Pelletier's results.

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[1] *Ann. Ch. Pharm.*, VI, 1836, 32.
[2] *Watt's Dictionary of Chemistry*, V, 196.

Carbon	..	..	57·28
Hydrogen	..	..	8·50
Oxygen	..	..	34·22

It differs from glycyrrhizin in its aqueous solution not being precipited by dilute mineral acids, and from the ordinary saponins in the large proportion of the insoluble hydrolyzed product. The occurrence of a glucosidal gum is peculiar in the vegetable kingdom, and it is proposed to submit its properties and composition to further chemical investigation.

19. Indian Dermaptera collected by Dr. A. D. Imms.

By Malcolm Burr, D.Sc., F.E.S.

I am indebted to Dr. A. D. Imms, Forest Zoologist to the Government of India, for the opportunity of examining a number of earwigs from various parts of India, the list of which is well worth publishing. A large proportion of the specimens were collected by him while touring, and are in the collections of the Forest Research Institute, Dehra Dun.

Family PYGIDICRANIDAE.

1. *Diplatys falcatus*, Burr.
   Shamkhet near Bhowali (Kumaon). 1 ♂.

Hitherto recorded from Simla and from the Dawna Hills in Lower Burma.

Also several immature, and therefore not accurately determinable specimens of the same genus, from Sat Tal, Airadeo, and Dehra Dun.

2. *Kalocrania picta*, Guer.
   Calcutta. 1 ♀.

3. *Cranopygia cumingi*, Dohrn.
   N. Coimbatore hills, 5th Aug., 1902. ♀. (No. 1076).

Also a male (No. 1074) in poor condition, which resembles this species, but the locality being Tharrawady, in Assam, it is probably distinct, as *C. cumingi* is a South Indian and Sinhalese species.

4. *Echinosoma sumatranum*, Haan.
   Dehra Dun : Jhajra, 2nd Febr., 1912. In dead Sal wood. ♂ ♀, and larvae.
   ,, Karwapani, 7th Nov., 1910. ♂.
   Kheri Forest Division : Bankatti, 28th Febr., 1912. Under bark of Sal (*Shorea robusta*). 1 ♀.
   Burma : Tenasserim, Salween River, 15th March, 1905. 1 ♀.
   ,, Tharrawady, 22nd Oct., 1905. Nymph.
   Himalayas, Kumaon : Bhowali (5,700 ft.) ♀.
   ,, ,, Dharmoti (5,000 ft.) ♀.

Family LABIDURIDAE.

5. *Anisolabis annulipes*, Luc.
DEHRA DUN: Underground. 2 ♂ ♂.

6. *Psalis dohrni*, Kirby.
HIMALAYAS, Kumaon: Takula. 2 ♂ ♂.
,, ,, Dharmoti.

7. *Psalis femoralis*, Dohrn.
DEHRA DUN: At light, 12th July, 1910. ♂, 1 nymph.

Also several Psalid larvae, probably of the three species above, but not accurately determinable from various localities.

8. *Labidura bengalensis*, Dohrn.
DEHRA DUN: 15th April, 1912. Underground. 18th Jan., 1904.
,, Garhi, 3rd-12th April, 1912. Many specimens.
ALLAHABAD: 20th Oct., 1908. 2 ♂ ♂.

9. *Labidura riparia*, Pall.
KURIDI JAUNSAR: 17th Dec., 1910. ♂.
DEHRA DUN: 23rd March, 1912. 2 ♂ ♂.

Both stunted specimens, and several larvae.

10. *Nala nepalensis*, Burr.
HIMALAYAS, Kumaon: Bhowali. ♀.
,, ,, Someswar. ♀. Under stones at the edge of a stream.

11. *Nala lividipes*, Duf.
DEHRA DUN: 29th Oct., 1910. 21st Nov., 1911. ♀ ♀.
HIMALAYAS, Kumaon: Bhowali. ♀.

12. *Forcipula pugnax*, Kirby.
HIMALAYAS, Kumaon: Bhowali. 8 ♂ ♂, 4 ♀ ♀.

13. *Forcipula trispinosa*, Dohrn.
DEHRA DUN: 25th Oct., 1910.

14. *Pseudisolabis immsi*, sp. n.

Small: slender: black: antennae greyish-brown, the segments rather short: head shining black, depressed, broad, eyes, small: pronotum strongly transverse, rectangular, smooth dull black, the sides yellow: legs slender, femora blackish, tibiae and tarsi dull yellow: abdomen dull black, nearly parallel-sided, very finely punctulate, with long, yellowish hairs: last dorsal segment ♂ very short and broad, unarmed:

♀ strongly narrowed : penultimate ventral segment ♂ broad, gently rounded : Forceps with branches ♂ remote, very slender and cylindrical, long and regularly arcuate almost in a semi-circle : in the ♀ simple, short, straight, contiguous.

	♂	♀
Length of body	9·5 mm.	8·5 mm.
,, ,, forceps	3·5	1

N. INDIA : Base of Himalayas at Kuridi in Jaunsar, 9000 ft. 17th Dec., 1910. ♂ and ♀

Pseudisolabis immsi, sp. n. Forceps of male, × 6.

This elegant little species, which is dedicated to Dr. A. D. Imms, is close to *P. burri*, Bor., from Kashmir, but the sides of the 5–7th abdominal segments in that species are more or less acute and rugulose : the forceps are much stouter and shorter than in *P. immsi*, and bowed apically instead of entirely and regularly arcuate.

Family LABIDAE.

15. *Chaetospania thoracica*, Dohrn.
DEHRA DUN : 15th April, 1912.

16. *Labia curvicauda*, Motsch.
THANO, 9th Febr., 1912, under bark of dead Sal tree (*Shorea robusta*).
DEHRA DUN : Jhajra, in dead Sal wood, 2nd Febr., 1912.
KHERI FOREST DIVISION : Bankatti, 27th Febr., 1912. Under bark in rotten wood of standing Sal tree.
DEHRA DUN : Karwapani, 7th Nov., 1910. ♀.
,, 7th Nov., 1910. ♀.

17. *Labia mucronata*, Stål.
BURMA : Tenasserim, Salween River. 8th March, 1905.

18. *Labia lutea*, Borm.
UPPER BURMA : Katha, 21st Febr., 1905. ♀.

19. *Spongovostox semiflavus*, Borm.
DEHRA DUN: Lachiwala, 16th Febr., 1912. Under bark of Sal (*Shorea robusta*).

Family FORFICULIDAE.

20. *Allodahlia macropyga*, Westw.
HIMALAYAS, Kumaon: Dharmoti. 3 ♀ ♀.
,, ,, near Bhowali. ♂ and 5 larvae.

21. *Homotages feae*, Borm.
HIMALAYAS, Kumaon: Dharmoti. 2 ♂ ♂.
,, ,, Bhowali, 2 ♂ ♂, 1 ♀.
,, Jaunsar: Kuridi, 17th Dec., 1910. 9 ♂ ♂, 6 ♀ ♀.
,, Mussoorie: Oct. 1907. ♂ and ♀.

22. *Elaunon bipartitus*, Kirby.
HIMALAYAS, Kumaon: Dinapani. ♂.
,, ,, Almora. ♀.
DEHRA DUN: 8th July, 1910. ♂.
HIMALAYAS: Naini Tal, Baldoti Plantation, 8th June, 1908. 2 ♀ ♀.

23. *Forficula beelzebub*, Burr.
HIMALAYAS, Jaunsar: Kuridi, 17th Dec., 1910. Numerous specimens.
,, ,, Mussoorie, Oct. 1907. ♀ (reddish form).
DEHRA DUN: Sept. 1901.
HIMALAYAS, Kumaon: Almora (5200 ft.), 21st June, 1912, 2 ♂ ♂, 4 ♀ ♀. Numerous larvae.
HIMALAYAS: Binsar (8000 ft.) 2 ♂ ♂.
,, Bhowali. 4 ♀ ♀.
,, Dharmoti. 4 ♂ ♂.
,, Shamkhet, near Bhowali. 5 ♂ ♂, 4 ♀ ♀.
,, Sat Tal (4000 ft.)
,, Simla. June 1909. A larva on a Deodar trunk.

After examining the ample material quoted above, I feel convinced that *F. aceris* and *F. beelzebub* are one species: the colour ranges from a bright blackish red to deep black; the armature of the dilated portion of the forceps varies, as also the sculpture, with the size and development of the individuals. It is possible to arrange a long series, the extremes of which are totally different, but it is impossible to say where *F. aceris* ends and *F. beelzebub* begins.

24. *Hypurgus humeralis*, Kirby.
DEHRA DUN: Sept. and Oct., 1910. ♀. Approaching the banded form.

25. *Eudohrnia metallica*, Dohrn.
HIMALAYAS, Kumaon: Bhowali, ♀.

20. The Pitt Diamond and the Eyes of Jagannāth, Purī.

By Rev. H. Hosten, S.J.

In a previous paper under this title (*J.A.S.B.*, 1912, pp. 133–144) we showed that there was no evidence to prove that the Pitt Diamond was stolen from Jagannāth's statue at Purī. We found that the theft was attributed to a variety of persons: to an Englishman, to a Frenchman, to a Portuguese, or to a jeweller belonging to no particular nationality. We were disappointed at the time in meeting with no variant of the Dutch burglar.

The Dutch, however, were not above suspicion. We have now come across a text in which a Dutchman is charged with the theft. It would seem that the custodians of the temple knew how to modify their story, so as to suit the national antipathies of their European inquirers. In this case, they told the story to a Frenchman, Anquetil du Perron, who was at Purī on June 6, 1757. Shortly before, he had been at Chandernagore, and there the story ran in 1753 that an Englishman had plucked out a precious stone from one of the eyes of the idol, while the Chandernagorians boasted in 1711 that a Frenchman had done it, the precious stone being then a *ruby*. For good reasons, Anquetil du Perron discredits the story altogether.

"I entered Jagrenat," he writes, "by the street leading to those Pagodas: it is a very long one and adorned with several large houses surrounded by gardens. I should have liked to see the interior of the Pagodas; unfortunately, I was known, and the money I offered did not prevail on the Brahmans to let me in: I had to be satisfied with examining the outside of the precincts . . .

"The theft of the ruby, which formed one of the eyes of the statue of Jagrenat, was confirmed to me: but I was told that the culprit was the Chief of a small Dutch Factory. The other eye, it is said, consists of a big carbuncle. I should think, however, that those precious stones and the immense treasures said to be contained in the Temple of Jagrenat are of the nature of the *Pagoda* [idol] *of massive gold and forty-two feet high*, which l'Abbé de Choisy saw at Siam (*Voyage de Siam*, p. 280). The Rajahs and Brahmans of Jagrenat are too greedy to set in wood or stone precious ornaments which they could easily replace, for the sake of the people, by mere gilt, or bits of glass, or false rubies placed in the proper light."[1]

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[1] Cf. Anquetil du Perron, *Zend-Avesta*, Tome I, Pt. I, Paris, 1771, p. lxxxii.

21. On Variations in the Flowers of Limnanthemum indicum, Thwaites.

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The observations recorded in this note on the flowers of *Limnanthemum indicum* were made on the 19th February 1912, on the specimens collected by me from a pond near Bassein in Thana District of the Presidency of Bombay.

The plants have a floating aquatic habit. The stem and roots are submerged. The orbicular leaves are floating, and the flowers are slightly raised above the water. It was not practicable from the trailing habit of the stem under water to recognize and isolate the individuals. Hence the enumerations made refer to several individuals taken conjointly.

Limnanthemum belongs to one of the gamopetalous orders, *viz. Gentianaceæ*. The majority of plants of this order are of the herbaceous erect or procumbent type occurring in more or less wet places. The genus *Limnanthemum* is an exception to the type as it grows in waters several feet deep.

Dimorphism within the order in genera other than *Limnanthemum* has been observed in *Canscora diffussa* (Prof. W. Burns, unpublished notes) in which styles have been noted to occur in two different lengths on the same plant. Dimorphism in the genus under consideration has been noted in all systematic works. A short description of the flowers of Limnanthemum indicum may be given at this point.

The flowers arise in clusters from a node. The node also produces a bunch of roots, a single branch, and a single floating orbicular cordate leaf, whose petiole is in a line with the stem. The flower buds are directed downwards and are under water. The buds come up one by one every evening to open. The flower remains open throughout the night and early part of the following day. The pedicel again bends downwards to mature the fruit under water. The following technical description is taken from Cooke's *Flora of Bombay Presidency*. "Pedicels 2″–5″ long; bracts ovate, acute membranous. Calyx $\frac{1}{3}$ in. long, deeply divided; lobes $\frac{1}{4}$ in. long, oblong, subacute. Corolla $1\frac{1}{2}$ in. across when expanded, white with a yellow centre; lobes usually 6 (5–7), oblong, obtuse, $\frac{1}{2}$ in. long densely clothed with long cottony papillose hairs not crested down the middle. Ovary one celled; placentas 2, parietal; style short or long stigma two lobed; Capsule subglobose, $\frac{1}{4}$–$\frac{1}{3}$ in. in diameter. Seeds numerous (30 or more), not muricate, shining, yellow."

The flowers collected and examined by me revealed a great deal of variation which is recorded at the end of this paper in a tabular form. It will be noticed that altogether 457 flowers were examined. The number of stamens always agreed with that of the petals in the same flower. The sepals agreed in number in 80% of the total with the petals and stamens, showed a deficiency in 5%, and an excess in 15% of the flowers examined. The variation in the number of parts in all the three whorls lay between 5 and 8. Fifty-one per cent of the flowers showed six parts in the petals and stamens (but not in the calyx at the same time) and 38% presented six parts in all the three outer whorls in the same flower. The pistil was trimorphic while the stamens were only dimorphic. Of every hundred flowers 51 had long stamens and 49 short ones. Regarding the pistil, in one form the style is practically absent, the blunt stigma being situated on the top of the subglobose ovary. In another form a distinct cylindrical style at least $\frac{1}{4}$ in. long is present, on the top of which comes the blunt stigma. In the third form the style is as in the last one; the stigmatic lobes, however, instead of being blunt, are narrow pointed and elongated, being about $\frac{1}{8}$ in. long. These three types were found in the proportions of 51, 33 and 16 respectively for every hundred flowers. The two forms of long styles are correlated with short stamens. The number of placentas varied from 2 to 4; but the majority of flowers, about 80%, had two and only two specimens had four. The flowers after noting down the points were thrown away barring some half a dozen which are preserved in alcohol. There was no variation in the colour of the flowers. Only 32% out of the 457 flowers examined had the typical number of parts according to the formula $K_5C_5A_5G_2$. The remaining 68% are distributed over twenty-three different forms represented by so many different formulæ. Amongst them the one of greatest frequency is $K_7C_7A_7G$ which forms 26% of the total. Next to it come $K_5C_5A_5G_2$ and $K_7C_6A_6G$ each forming only 6·5% of the whole. If we take into consideration not merely the numerical differences but also the trimorphism of the pistil, we get altogether fifty-five different forms of the flower. I am not aware of this record exceeded anywhere.

Variations in the flowers of *Limnanthemum indicum*.

(K=*Calyx*; C=*Corolla*; A=*Stamens*; G=*Pistil.*)

		$C_5 A_5$		$C_6 A_6$		$C_7 A_7$			$C_8 A_8$		Totals.				
		$K_5 C_5 A_5$		$K_6 C_6 A_6$		$K_7 C_7 A_7$			$K_8 C_8 A_8$		Style short.	Style long.	Style and stig. long.		
		G_2	G_3	G_2	G_3	G_2	G_3	G_4	G_2	G_3					
Style short ..		8	2	64	19	60	11	0	6	5					
Style long ..		6	0	58	6	37	9	2	5	3					
Style and stig. long ..		2	0	25	4	22	3	0	1	4					
Separate Totals	G_2	16		147		119			12		138	103	50	294	
	G_3		2		29		26			12	40	18	11	69	
	G_4							2				2		2	
Combined Total ..		18		176		147			24		178	126	61		365 (80%)

		$K_6 C_5 A_5$		$K_5 C_6 A_6$		$K_5 C_7 A_7$			$K_7 C_8 A_8$						
		G_2	G_3	G_2	G_3	G_2	G_3		G_2	G_3					
Style short ..		4		3	1	1	1			1					
Style long ..		1		2	2	0	0			0					
Style and stig. long ..		1		1	0	0	0			0					
Separate Totals	G_2	6		6		1					8	3	2	13	
	G_3		0		3		1			1	3	2	0	5	
Combined Total ..		6		9		2			1		11	5	2		18

		$K_7 C_5 A_5$		$K_7 C_6 A_6$		$K_8 C_7 A_7$									
		G_2	G_3	G_2	G_3	G_2	G_3								
Style short ..		0		14	6	5	2								
Style long ..		0		10	2	1	1								
Style and stig. long ..		1		6	1	1	0								
Separate Totals	G_2	1		30		7					19	11	8	38	
	G_3		0		9		3				8	1	3	12	
Combined Total ..		1		39		10					27	14	9		50

		$K_8 C_6 A_8$		$K_9 C_7 A_7$											
		G_2	G_3	G_2	G_3										
Style short ..		2	1	10	2										
Style long ..		3	0	2	1										
Style and stig. long ..		0	0	1	2										
Separate Totals	G_2	5		13							12	5	1	18	
	G_3		1		5						3	1	2	6	
Combined Total ..		6		18							15	6	3		24

Totals of the whole.	G_2	23		188		140			12		117	125	61	363 or	79·5%
	G_3		2		42		35			13	54	24	14	92 or	20%
	G_4							2				2		2 or	15%
	Total	25		230		177			25		231	151	75		457
	Percentage	5%		51%		39%			5%		51%	33%	16%		

22. History of Kāśmīr.

By Pandit Anand Koul.

A brief account of Hasan, the Historian of Kāśmīr.

Moulvi Hasan Śah was born at a village called Gámru, a mile to the south-east of Bandipur in Kāśmīr, in 1248 A.H. (1832 A.D.) and died at the same village in 1316 A.H. (1898 A.D.) at the age of 66 years. He came of a family of Pirs or Muhammadan priests, distinguished in Persian and Arabic learning. His seventh ancestor was a Kāśmīri Brahman, named Ganeś Koul, who became a convert to Islám, being named Śekh Gázi-ud-din. This man's eldest son, Śekh Yáqúb, was a scholar of much renown and was, therefore, taken in the court of the Mogul Emperor, Śah-i-Jahán. Hasan Śah's father, Moulvi Gulám Rasúl, wrote four books in Persian poetry, called *Majmua Śeva*, *Risála Turfa*, *'Ajib Manzar*, and *Karámát-i-Auliá*. The father taught his son Persian and Arabic and made him as much accomplished in these languages as he himself was. Hasan also learnt the Greek system of medicine from other teachers which he practised until the closing years of his age.

In 1875-78 A.D. occurred a terrible famine in Kāśmīr whose ravages assumed appalling proportions. Hasan wrote out a pamphlet in Persian verse in which he described the true character of the calamity and made certain sensible suggestions for the improvement of the situation. He sent this pamphlet to Diwán Anant Rám, the then Prime Minister, to be presented to His Highness the late Mahárája Ranbir Singh who was at that time at Jammu. The Mahárája conferred a Khilat of honour upon Hasan as a mark of recognition of his literary merits.

After this, Hasan wrote three books in Persian and Kāśmīrī mixed, which are greatly admired by the public. Their names are—*Gulistán-i-'Ikhláq*, *Kharita Asrár*, and *'Ajáz-i-Garíba*. He once went to Ráwalpindi and there came to know that there was a Persian History of Kāśmīr written by Mula Ahmad at a village called Pindori in the Ráwalpindi district in the possession of a man named Mulah Muhmúd. This History is a very rare book. It is said to be the translation of an ancient book called Ratnákar Purána containing the accounts of thirty-five kings who ruled in Kāśmīr five thousand years ago, and also of seven kings who ruled in Kāśmīr from the end of second to the beginning of sixth century of Christian era, which accounts were lost to history. Ratnákar Purána had been discovered in

the time of Zain-ul-ábdin who reigned in Kāśmīr from 1422 to 1474 A.D., and under his orders Mulah Ahmad, the poet laureate of his court, translated it into Persian. Ratnákar Purána is now again untraceable, and on this account the above-mentioned translation is of immense importance.

Hasan went to Pindori and took a copy of this History. Returning to Kāśmīr he wrote a History of Kāśmīr of his own, in which he embodied the important facts he had found in Mulah Ahmad's History of Kāśmīr. This copy of Mulah Ahmad's History was subsequently lost by him in a flood in which his boat capsized, he being thrown into water together with the book and rescued but alas! without the book.

In 1902 A.D. the Kāśmīr Durbar tried to secure a copy of Mulah Ahmad's History, but Mulah Mahmúd, from whom Hasan had got his copy, had since died and his family had removed to Kabul at the invitation of His Majesty the late Amir Abdul Rahmán Khán.

Hasan gave a subtle touch of humour mingled with cunningness to his deeds as a priest. One or two anecdotes might be mentioned. Once a woman told him that her mother-in-law was often quarrelling with her, and asked for a charm so that the quarrels might cease. Hasan gave her a charm, enjoining upon her that whenever her mother-in-law would begin to utter harsh words to her she should at once put the charm under her own teeth and press it hard. The Pir's instructions were faithfully followed. The daughter-in-law having the charm pressed under her teeth could not open her mouth to remonstrate with her mother-in-law for her vituperations and the latter's fury would consequently at once abate. The result was that there was soon peace between them. The simple woman ascribed this change not to her own silence, but to the efficacy of the charm, for which she came to the Pir and thanked him. Another time a woman told him that whenever she sat down to spin, it would happen that she had to go away to do some other more urgent work and she, therefore, requested to be given a charm in order that she might keep herself busy with her spinning wheel. The Pir gave her a charm with a thin thread attached to either end of it, enjoining upon her to tie it up with her own toe on one side and with the spinning wheel on the other, whenever she went to spin, taking care that the thread would not break. The result was that she thought of nothing but the thread which the Pir had said must not break, and the consequence was that her thoughts became concentrated and she forgot everything else while spinning. The ignorant woman ascribed all this to the wonderful efficacy of the charm and had firmer faith in the Pir.

Sir W. R. Lawrence, when Settlement Commissioner of the Kāśmīr State, was supplied by Hasan with much historical

information and was also taught the Kāśmīrī language by him. In page 454 of his *Valley of Kashmir* Sir Walter thus expresses his gratefulness to the man :—

"What else (Kaśmīrī language) I have learnt, I owe to Pir Hasan Śāh, a learned Kaśmīrī, whose work has entirely been among the villagers."

When Sir Walter became Private Secretary to His Excellency the Viceroy he sent an invitation through the Resident in Kaśmīr asking Hasan to come to Simla to be presented to His Excellency, but the invitation came too late, as Hasan had died just a few days before.

Hasan had only one son, named Gulám Muhammad Ali, who died in 1311 A.H. (1893 A.D.) in his 35th year of age, leaving two sons, named Gulám Mustafa and Gulám Muhammad Sa'id, behind. These are now at their native village engaged in their hereditary occupation of priesthood of a large number of Muhammadans, and are also doing agriculture.

In Part II, Chapter I of my paper on the History of Kāśmīr published in this Journal for April 1910, I stated that Kalhaṇa had written in his Rájataraṅgiṇī that the reign of king Raṇáditya extended over 300 years. It is needless to remark that attributing such a longevity to a human being is simply extravagant. It was evidently intended to cover a great break of which no record of the succession of kings was forthcoming in the time of Kalhaṇa Even an orthodox Hindu will shake his head on hearing it, remembering that in this Kaliyuga age the span of man's life is only 120 years, beyond which even the incarnation of Viṣṇu, *i.e.* Kṛiṣṇa, could not live.

Hasan, the author of the Persian History of Kāśmīr, however, says that Ranáditya reigned for only 60 years and 3 months, which of course seems probable, and seven kings ruled, six preceding and one following him, whose accounts have been omitted in the Rājataraṅginī. According to this author this period extended over not 300 years but 329 years and 5 months. He has given the names as well as the accounts of the rule of these seven kings, one of whom is Vainyaditya, who, though not mentioned in the Rājataraṅginī, is well remembered even to the present day by every household in Kāśmīr as to have been an extremely good and virtuous ruler. His name has descended down from generation to generation and his fame in Kāśmīr has equalled, if not excelled, that of Vikramāditya of Ujain. There occurs in the Rājataraṅginī (Book V. 97-100) a temple by the name of Vainyāsvāmin about whose founder no mention is made therein anywhere, but it proves that there was a king of the name of

Vainyāditya who had built it. Hasan derives his authority from the Persian translation of the Ratnákar Puráṇa which Zain-ul-ābdin, who reigned in Kāśmīr from 1422 to 1474 A D., had got prepared from Mulah Ahmad, the poet-laureate of his court. I have already attempted to discuss the reliability of Hasan's History in the above-mentioned paper and it is unnecessary to repeat it here.

So this is the second gap in the Rájataraṅginí. The first is for a period for which Kalhaṇa stated that he could not get the accounts of thirty-five kings who had ruled during it, which accounts, however, I have given from Hasan's Persian History in the above-mentioned paper. Need I say how important it is to the historians to find this second gap also filled up? I, therefore, give in the following pages the accounts of the kings who ruled during the above period, of which, as I have stated above, 300 years are incorrectly ascribed to only one king (Raṇáditya) by Kalhaṇa.

Tuñjīna—191-234 A.D.

Tuñjīna was the second son of Yudhiṣṭhira and after the death of his brother, Narendrāditya, proclaimed himself King of Kāśmīr. Narendrāditya had a son named Śradwal whom Tuñjīna appointed as his minister. In course of time they fell out with each other and the result was that Śradwal was murdered. Śradwal left a son named Sarabsena, seven years old, and this poor helpless boy, out of fear of Tuñjīna, escaped with his mother to Nagarkot. The chief of Nagarkot was glad to have him, and he subsequently gave him his own daughter in marriage. When he attained majority, he collected some troops and also obtained help from the chief of Jammu and then set off *via* Bānihāl to make war with Tuñjīna. Tuñjīna went out to Bānihāl to fight with him but was killed in the battle.

Tuñjīna's reign extended over 43 years.

Sarabsena—234-82 A.D.

After Tuñjīna, Sarabsena ascended the throne. He established order and good government throughout the country and recovered all the countries conquered by Pravarasena II, which had, after his death, become independent chiefships. He went to India twice and invaded and conquered many countries. His queen was the daughter of the King of Kanauj. He built a temple of Bhuteṣvara at Vicārnāg (the northern suburb of Srinagar).

Sarabsena died after reigning for 48 years.

Gandharbsena—282-319 A.D.

Gandharbsena, son of Sarabsena, now sat on the throne. His reign was marked with slothfulness diversified with cruelty.

Taking advantage of his weak rule, the Chiefs in India, who were considering themselves under the suzerainty of the King of Kāśmīr, shook off his control. It is said he had brought a dancing girl from India, and was passing day and night in her company. Consequently the government fell into disorder.

Lachman, grandson of Tuñjīna, was then a Jagir-holder at Dachinpor. He took the opportunity, and coming with some troops laid siege to the palace. For seven days the struggle continued. The king's troops, who had become disgusted with his conduct, went over to the intruder's quarters and then the king had to surrender. Lachman captivated him and took possession of the kingdom.

Gandharbsena ruled for 37 years.

Lachman—319-52 A.D.

Lachman ascended the throne in 319 A.D. and ruled well, checking the tide of extortion and misgovernment The Chieftains of the distant parts of Kāśmīr, who had revolted in the time of his predecessor, were brought again to submission by him. The Chief of Multān, named Sukaram Pāl, had rebelled and he marched with his troops to subdue him. When he arrived in the Panjáb, a mishap occurred. He was sleeping under a tree with a red handkerchief spread over his face. An eagle taking it to be a piece of flesh pounced upon him. Its sharp talons pricked down through the handkerchief right into the king's eyes and pulled them out. The king had a very severe pain and in three days died.

He reigned for 32 years and 6 months.

Śūrak—352-403 A.D.

Lachman's brother, named Śūrak, succeeded him. He completed the expedition successfully which his predecessor had commenced. Sukaram Pāl, Chief of Multān, retired into a fort and held out for one month, but ultimately made peace, agreeing to pay a tribute to Śūrak. After this the victorious king returned to Kāśmīr.

Later on, a chief, Dārdu by name, rebelled and coming into the Kāmrāj plundered the villages. Śūrak with his troops went out to oppose him and Dārdu together with his men retreated and fled away into the hills, but Śūrak pursued them. He went too far without circumspection until Dārdu's men entrapped him and his force between two hills and cut off their supplies. They also rolled down stones from the hills upon them and killed all the troops. The king was taken prisoner and detained in a fort at Paṭṭan.

Vajrāditya was the son of king Lachman. He went with a force to get his uncle released. He first marched over the

country of Dārdu, sacked it and massacred its inhabitants and then came to Paṭṭân and took the fort by storm but too late, as just at his approach the enemy cut off the head of Sūrak and threw it down over the walls of the fort.

Sūrak's reign extended over 51 years.

Vajrāditya—403-14 A.D.

Vajrāditya ascended the throne in the year 403 A.D. He had, however, to contend with the son of Sūrak named Jayendra. They fought in the Marāj Division for one year without either of them getting vanquished. At last Vajrāditya accomplished his purpose in a particularly cruel and treacherous manner. He negotiated and made peace with his foe and when the latter came over to his camp, he basely murdered him. Jayendra's troops got frantic and indignant at this treachery and fought with Vajrāditya until 10,000 troops were lost on both sides. Vajrāditya, however, won the field and returned to his capital. He was a good ruler. He built many temples and repaired Vijajeshvare temple. In his time the grains were very cheap, husked rice selling at 8 pice a *Kharvár* (96 seers). He reigned for 10 years and 8 months.

Raṇāditya—414-74 A.D.

Raṇāditya succeeded his father in 414 A.D. He was a glorious king,—powerful, just, generous and good. His head was formed like a shell. He had a beautiful queen named Raṇa-rambhā. There is a legend that he was in his former birth a gambler. Having lost all his property in gambling and then being disgusted with himself, he desired to see the goddess Bhramara-vāsini on the Vindhyā mountain, to obtain from her the boon of feeling indifferent to his own life. But the way to the place being infested with stinging bees and other insects, he, to protect himself, first covered his body with a metal armour, over which he put on a buffalo hide and over it again a plaster of clay mixed with cow-dung. He then set off, reaching his destination quite emaciated by the long and difficult journey and tormented with the stings of bees which had pierced even through his strong coverings. The goddess touched him and he was restored to his strength. The goddess then disappeared and presently a beautiful maiden was seen by him near by. The woman compassionately spoke to him that he had taken so much pains to come up to this difficult place and told him to ask for a boon. He was charmed with her beauty and said to her that the boon he would ask for was that she should become his wife. The woman said she was no other but the goddess Bhramara-vāsini and could not be a wife to a mortal. But he insisted that he would ask for no other boon, and if she

was to keep her word she should accede to his request. She then told him that it would be so in another birth. After this he committed suicide by throwing himself down from a tree at Prayāga (the junction of the Sindh river with the Jhelum near Śādipur) in the hope of taking a fresh birth in union with the goddess. He was born as Ranāditya and she as Ranā-rambhā. The latter was found floating in the ocean by the king of the Cholas (Tanjore) named Ratisena, who picked her up and nourished her. When she was grown up, several kings asked for her hand but Ratisena would not consent. Ranāditya also sent his minister for this girl and Ratisena was about to give his refusal when Rāṇa-rambhā declared to him that this king should be her husband. She then related to him the whole story of her origin and thereupon Ratisena sent her to the residence of one of his friends, the king of Kuluṭa (Kulu) where the nuptials were to be celebrated. Raṇāditya went to Kulu and married her. As she could not touch a mortal, she never touched him. She used to deceive the king by keeping in bed a phantom woman resembling herself and would herself go out at night in the form of a bee.

Raṇāditya built two temples to the west of the Hari-Parbat hill in his own name and in that of his queen, and had two Śivalingas made for them. One day was remaining to the date fixed for their consecration when an astrologer, who had arrived from abroad, said that both these Liṅgas were hollow containing broken pieces of stones and frogs. The date of consecration being so near, new Liṅgas could not be prepared in time and the king, therefore, fell into much anxiety, not knowing what to do. At that time the queen spoke to him—"At the marriage of Śiva with Pārvatī, Prajāpati officiated as priest and he brought the image of Viṣṇu for being worshipped by the bride groom. When Śiva saw this image he considered it valueless as it represented Śakti alone without Śiva. Śiva then put together into a lump all the jewels brought as marriage presents by gods and Asuras and moulded them into a Liṅga. This Liṅga and that image of Viṣṇu came afterwards in the hands of Rāvana who used to worship them at Laṅkā (Ceylon) and after his being killed by Rāma were carried away by the monkeys to the Himálayas. These beasts after satisfying their curiosity dropped them into the Uttara-mānasa (Gangabal) lake." The queen further said—"I have already had these brought out of the lake and to-morrow you will see them here in this palace, and they may be consecrated in the two new temples." The queen retiring to her apartments expressed her thoughts to demigods, and they at her bidding at once went and brought the two images at the palace

Next morning the king's happiness knew no bounds to see them come just in time, and he began first to consecrate the Raṇesvara Śiva-liṅga when the image of Raṇāsvāmin, through

the power of Ranā-rambhā, seated itself miraculously on the *pīṭha*. The queen offered her property to the latter image, and several villages were presented to it by other worshippers.

It is said there was a water-carrier, named Brahma, who in reality was a Siddha, and the queen knowing his true worth made him consecrate the two images. Having been recognized by the people, he moved through the air after consecrating the Raṇ-ēśvara Liṅga and consecrated the Raṇāsvāmin secretly. The queen erected a grand hall in honour of this Siddha which she called Brahma-maṇḍapa.

Raṇāditya and his queen also built the temples of Raṇā-rambhā-svāmin and Raṇā-rambhā-deva and a Maṭha for mendicants on the Hari Parbat hill, probably on its southern side, which gave Raināvari (eastern suburb of Srinagar) its name. The king also established a hospital for the sick and suffering poor, in order to ward off a danger threatening his another queen, Sena-mukhi. He erected a temple of Mārtaṇḍa (Sun) at the village of Siṁha-rotsika which he called Raṇapura-svāmin. The modern name of Siṁha-rotsika is Sumra-bug village near Pāntachuk (5 miles from Srinagar on the Anantnāg road) on the left bank of the Vitastā. At Pāntachuk is the Kurukṣetra pilgrimage where Hindus go to bathe on the occasion of solar eclipse. Another queen of his, Amṛita-prabhā, built the shrine of Amrt-ēśvara on the right side of Raṇeśa. She also placed an image of Buddha in the Vihāra built by Bhinna, one of the wives of king Megha-vāhana.

Raṇā-rambhā had given the king a magic spell, called Hāṭakeśvara, which gave him command over the Netherlands. The king performed severe austerities at Iṣṭikā-patha (Rāmarādan from which the ascent to the Gangabal pilgrimage begins) and then went to Nandi-śilā (Nund-kol lake). Afterwards he entered the cave of Namuchi (Namcibal, near the 3rd bridge in Srinagar) together with his retinue. There he remained in company with a Daityā woman and never came out. Meanwhile Ranā-rambhā went away to Śveta-dvīpa (White Island), probably the small island called Rupalank or Silver Island in the Dal lake.

Ranāditya's rule lasted 60 years and 3 months.

Vainyāditya—474-521 A.D.

Vainyāditya sat on the throne of his father, Ranāditya, in 474 A.D.

He went, when yet a boy eleven years old, to visit different countries in India in company with his uncle, Maṅgalāditya. After visiting various places of worship he went to the Śivālik mountains where he saw a recluse, named Ganapat, who had been living in a cave since 100 years. Vainyāditya remained with him, and, under his guidance, practised penances for

twelve years, taking no food except a cup of milk each day. He became a perfect ascetic and after twenty years returned to Kaśmīr at the bidding of his spiritual guide. Here he stayed for one year in the Jiṣṭeśvara temple on the top of the Takht-i-Sulemán hill.

When Raṇāditya retired into the cave of Namcibal, the courtiers approached Vainyāditya and requested him to sit on the throne, but he declined. Thereupon all the people swarmed round him, and at last, to avoid disappointing them, he accepted their offer but, before doing so, took pledge from them that in his time they should never tell a lie; should never break a promise; should cause no gratuitous injury; should abstain from unlawful means of gain; and should never kill a living creature. He then came down the hill and at Gagribal built an abode for himself near which two vaults were constructed. In one of these vaults the revenue of the Marāj Division and in the other that of the Kāmrāj Division was to be deposited. He then issued an edict to the effect that villagers should themselves come at the end of a year and deliver the value of the tenth part of their produce into their respective vaults, and brought the whole revenue-collecting staff under reduction. The villagers were thus eased of all official interference He appointed his brother, named Vikramāditya, as Commander-in-Chief and kept the key of the Kāmrāj Treasury vault with him. At the end of each month he used to open the treasury and disburse pay to the troops and other employees. Whatever money from miscellaneous sources was collected by day was distributed among the poor in the evening, nothing being left for the morrow. For his own subsistence he used to cultivate himself a piece of land and out of it the value of the tenth part was, like other cultivators, given to the treasury as government share. Till the end of his reign every cultivator used to pay his dues himself, and anyone failing to do so somehow came to grief. Anyone taking what did not legitimately belong to him suffered in some way or other; and anybody attempting to steal got his hand withered. Under these halcyon state of affairs none had any trouble. Being an ascetic himself, whatever he would utter at the riverside, would happen at once. Any person committing an offence got punishment by his curse. All his life through he wore a quilt like a fakīr, and never tasted flesh meat. He built the temple of Vainyā-svāmin at Trigām at the confluence of Sindh with the Vitasta.

This noblest and purest of Kaśmīr kings died after 47 years' peaceful and happy rule.

23. The Double Mercuri-periodides of Substituted Ammonium Bases. Tetrapropylammonium Mercuri-periodide.

By Rasik Lal Datta and Haridas Mukherjea.

In a paper to the Chemical Society (Trans. Chem. Soc., 1913, 103, 426), it has been pointed out by one of us that when platinic chloride or cupric chloride is added to substituted ammonium iodides, a double decomposition takes place resulting in the formation of double platinic and cupric iodides. In the case of double platinic iodides, the platinic iodide itself is stable and no special care has to be taken for preparing the double salts, but in the case of double salts with cupric iodide, the cupric iodide is unstable, decomposing into cuprous iodide and iodine.

It has been pointed out before that the heavily substituted ammonium bases form with remarkable facility the double cupric iodides, since they contribute materially to their formation by reason of the affinity of those bases for iodine. It is for this reason that no double salt of cupric iodide has been obtained with the iodides of alkali metals and lightly substituted ammonium bases, while the platinic iodides form double iodides with them with great ease.

There is, then, a strong affinity of the substituted ammonium bases for iodine as exemplified in the above reaction, and as also is evident from the formation of several polyiodides of those bases containing two, three or four atoms of iodine. This strong affinity of the bases for iodine suggested to us the possibility of formation of double salts in which there are higher valencies in existence as regards iodine and accordingly the preparation of double mercuri-periodides was undertaken.

But in this case the method of preparation has been varied a little from the usual method of double decomposition in as much as the hexavalent mercury atom has not been realized in the case of any salt of mercury. In the case of double salts with cupric iodide, we had a parallel valency in cupric chloride and hence the method of double decomposition was feasible. The following direct method has been used successfully for the preparation of double salts with mercuri-periodide.

Mercuric iodide and iodine in the ratio of $HgI_2 : I_4$ are dissolved in a solution of potassium iodide. The resulting solution contains presumably HgI_8 in a very loose state of combination When the solution thus prepared is added to a substituted ammonium iodide, it exerts a stable influence on

the iodine and mercuri-periodide comes out as a precipitate in double combination.

Tetrapropylammonium Mercuri-periodide.

$$5N\,(C_3H_7)_4\,I,\,HgI_6.$$

The solution of mercuric iodide and iodine was prepared by dissolving weighed quantities in potassium iodide and the dark red solution thus obtained was added very gradually, with stirring, to an excess of a strong solution of tetrapropylammonium iodide. The precipitate thus obtained was triturated in a mortar with the mother liquor, filtered and washed with a small quantity of water, since on the addition of a large quantity the salt decomposes with the liberation of iodine, as observed in the case of double cupric iodides. The precipitate was dried in a desiccator over sulphuric acid and had a brown colour.

The salt on analysis gave the following results :—

0·3631g gave 0·0308 HgS ; Hg = 7·48

0·1190g gave 0·1195 AgI ; I = 54·29

Calc. for $5N\,(C_3H_7)_4I,\,HgI_6$; Hg = 7·91 ; I = 55·28.

The mercury was estimated by dissolving the salt in nitric acid with the help of a little hydrochloric acid and then precipitating by sulphuretted hydrogen. During the dissolution of the salt in the acid an interesting fact was observed. The salt was first treated with nitric acid when some vapours of iodine came out, and before the dissolution was complete and perfect, hydrochloric acid was added when a yellow precipitate formed, which ceased to dissolve when diluted with water. The precipitated salt was found on examination to be a double salt of mercuric iodide, having a formula $2N(C_3H_7)_4I,\,HgI_2$. The decomposition that takes place might be represented thus :—

$$5N(C_3H_7)_4I,\,HgI_6 = 2N(C_3H_7)_4,\,HgI_2 + 3N(C_3H_7)_4I + 2I_2$$

We are at present engaged in preparing a series of double mercuri-periodides with various substituted ammonium bases and also other persalts by similar methods.

We take this opportunity to express our best thanks to Professor P. C. Rây for his kind encouragement.

24. The Action of Nitrosyl Chloride on Secondary Amines. Methylbenzylnitrosamine and Ethylbenzylnitrosamine.

By Rasik Lal Datta.

The action of nitrosyl chloride on aliphatic amines was studied for the first time by Solonina (J. Russ. Chem. Soc., 1898, 30, 43). For this purpose, he added an ethereal solution of nitrosyl chloride to a solution of the amine in ether. The results which he obtained with the primary amines were somewhat irregular. For instance, with benzylamine, benzylic chloride and benzylamine hydrochloride were the products. With isobutylamine, isobutyl chloride, tertiary butyl chloride and nitrosoisobutylene were formed. Ethylamine gave nitrosodiethylamine. Of these results, the formation of nitrosodiethylamine from ethylamine is the most interesting.

But the results which he obtained with the secondary amines were regular and nitrosoamines were produced. He thus obtained the following nitrosoamines, viz. nitrosodiisobutylamine, nitrosodipropylamine and nitrosopiperidine from the corresponding secondary amines.

To study the general applicability of the method and also the action of this reagent on tertiary cyclic bases, this investigation was undertaken. In this communication, the results are described of the action of nitrosyl chloride on two secondary amines, methylbenzylamine and ethylbenzylamine, which give rise to methylbenzyl- and ethylbenzyl-nitrosamines. These nitrosamines are interesting for they have not been hitherto prepared, though the first of the two was obtained in the course of double decomposition between methylbenzylamine hydrochloride and silver nitrite (Ray and Datta, Proc. Chem. Soc. 1912, 28, 258).

Nitrosyl chloride was prepared according to the method of Tilden (Journ. Chem. Soc., 1860, 13, 630). For this purpose a mixture of nitric acid (Sp. Gr. 1·42) and hydrochloric acid (Sp. Gr. 1·16) was heated and the dried vapours passed into a solution of sulphuric acid; a mixture of nitrosyl chloride and chlorine was evolved, the former was absorbed by sulphuric acid forming nitrosylsulphuric acid, while the latter escaped. The nitrosylsulphuric acid thus obtained was heated with anhydrous sodium chloride, when a stream of nitrosyl chloride was obtained.

Instead of using an ethereal solution of nitrosyl chloride as did Solonina, the gas was directly passed into an ethereal solution of the amine, when secondary nitrosamine and amine

hydrochloride are produced, the former remaining in solution and the latter precipitating out.

Methylbenzylnitrosamine.

The amine used was obtained from Kahlbaum. Nitrosyl chloride was passed into the ethereal solution of methylbenzylamine when methylbenzylnitrosamine and methylbenzylamine hydrochloride were produced, the former going into solution and the latter precipitating out. The precipitate of methylbenzylamine hydrochloride was filtered and the filtrate allowed to evaporate in air, when a yellow oil was left behind. The oil was tested with phenol and sulphuric acid according to Liebermann when it proved to be a nitroso compound. Finally, analysis indicated that it was methylbenzylnitrosamine.

0·1722 gave 29 c.c. N_2 at 31° and 760 m.m.; N = 18·30

0·2089 gave ·4832 CO_2 and ·1276 H_2O; C = 63·09, H = 6·77

Calc. for $C_7H_7CH_3N(NO)$; C = 64·00; H = 6·66; N = 18·66.

It is a yellowish oil, insoluble in water and soluble in alcohol and ether. It possesses a peculiar smell by which means it can be readily detected. Its boiling point could not be determined as the quantity prepared was too small. This and other constants will be described in a future paper.

Ethylbenzylnitrosamine.

Ethylbenzylnitrosamine was prepared similarly to methyl benzylnitrosamine by passing nitrosyl chloride through an ethereal solution of the amine, filtering off ethylbenzylamine hydrochloride and evaporating the solution in air. Ethylbenzylamine hydrochloride does not give the corresponding nitrosamine in the course of double decomposition with silver nitrite, but the nitrite could be obtained by evaporating the solution in vacuum over sulphuric acid. The oil was tested and analysed :

0·1422 gave 21 c.c. N_2 at 28° and 760 mm.; N = 16·43.

Calc. for $C_7H_7.C_2H_5N\,NO$; N = 17·07.

It is a yellowish oil, insoluble in water but soluble in alcohol and ether, possessing a peculiar odour.

The action of nitrosyl chloride on cyclic and tertiary bases is under investigation.

A REPORT ON THE BIOLOGY OF THE LAKE OF TIBERIAS.

Second Series.

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The first series of papers in this Report was published in Vol. IX, No. I, of this Journal, pp. 17–88 (1913).

25. The Leeches of the Lake of Tiberias.

By N. Annandale, D.Sc., F.A.S.B.

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The Hirudinean fauna of the Lake of Tiberias is a poor one and may now be regarded as well known, for three separate collections from the district have agreed with one another. These three collections are (i) that made by Dr. Th. Barrois in 1890; (ii) that made by Dr. Festa in 1893; and (iii) that made by myself in 1912. The two former were described by Prof. R. Blanchard, the one in the *Révue de Biologie du Nord de la France* (Vol. VI, pp. 41–46; 1894), the other in the "Bolletino" of the Turin Museum (Vol. VII, No. 161, pp. 1–3; 1893).

My own collection includes specimens of three species, one of which was not taken in the immediate vicinity of the lake, although doubtless it occurs there. I have found it necessary to recognize the local form of one common species as a distinct race or subspecies. The species are—

Placobdella catenigera (Moq.-Tand.).

I found a large specimen under a stone in the stream that runs through the Wad-es-Semakh. It was full of blood and had probably just left a tortoise, for the species is parasitic on aquatic Chelonia. A very young leech possibly of this species was found under a stone at the edge of the lake near Mejdal. *P. catenigera* is widely distributed in Eastern Europe and Western Asia.

Haemopsis sanguisuga (Linn.).

Several specimens were obtained from the village fountain at Kefr Kenna between Tiberias and Nazareth. The species is common in such situations in Palestine and probably shares with *Limnatis nilotica*[1] the habit of entering the throats of animals and persons who drink incautiously at springs, causing thereby great discomfort and even danger.

Herpobdella (*Dina*) *lineata* (O. F. Müller).

This is the only leech at all common in the lake. It is discussed in the following note —

Herpobdella (Dina) lineata (O. F. Müller).

Dina blasei, Blanchard, *Att. Soc. lig. Sci. Nat. Geog.* III, No. 4 (1892); *Riv. Biol. Nord France*, VI. p. 45 (1894); *Boll. Mus. Torino* VIII, No. 161, p. 3 (1893).

[1] Cf. Masterman, *Parasitology* I, p. 282 (1908).

Nephelis gallica, *id.*, Bull. Soc. zool. France XVII, p. 172 (1892).

Dina latina, *id.*, Att. Soc. lig. Sci. Nat. Geog. III, No. 4 (1892).

Dina quadristriata, *id.*, *Boll. Mus. Torino* IX. No. 192. p. 60 (1894).

Herpobdella lineata, Johansson, *Zool. Anz. XXXVI*, p. 379 (1910).

Herpobdella lineata, Rousseau, *Ann. Biol. lacustre* V, p. 79 (1913).

This species has, especially in the last few years, been subjected to many changes of name:[1] there seems little doubt that it is the one called *Hirudo lineata* by F. O. Müller and that *lineata* is therefore the correct specific designation. The generic name, however, has also been called in question. In 1893 Blanchard made it the type of his new genus *Dina*, because it differed from other Herpobdellidae in that the third ring of the somite was enlarged and divided longitudinally by a superficial furrow. This feature, which is shared with at least one other European species (*Dina absoloni*, Johansson),[2] is evidently constant, although often difficult to detect, and may be regarded, as Johansson (1913) suggests, as of subgeneric value.

The typical form of the species is widely distributed in Europe, North and Central America and occurs also in Madeira and the Azores. Varieties or local races have been described (in Russian[3]) from Siberia and Mongolia.

Blanchard (1894) describes the colouration of "*Dina quadristriata*" as follows:—"*Venter pallidus. Dorsum cinereum aut subviride, quatuor taeniis nigris ornatum, maculis albidis aut subflavis praesertim supra primum annulum somiti notatum.* But, although the living individuals I saw in Palestine and Syria varied somewhat in the exact shade of the dorsal surface, they agreed in being absolutely devoid of all trace of definite markings. I propose, therefore, to regard the race as distinct under the name:—

Subsf. **concolor**, *nov.*

This race is distinguished from the typical form of the species by the absence of all trace of the longitudinal stripes which are usually a conspicuous feature of the colouration. The ventral surface is devoid of superficial colour, while the back is uniformly suffused with black pigment, to a different

[1] See Johansson's paper "Zur Kenntnis der Herpobdelliden Deutschlands," *Zool. Anz.* XXXVI, p. 379 (1910), and Rousseau, "Les Hirudinées d'eau douce d'Europe," *Ann. Biol. lacustre* V, p. 286 (1913).

[2] *Zool. Anz.* XLII, nr. 2, p. 79 (May 1913).

[3] Plotnikow, *Ann. Mus. Zool. Ac. Sci. St. Pétersbe* X, p. 153 (1905).

ERRATA.

In Journal, Vol. IX, No. 6, 1913, page 212—

Line 22, from top, *for* "divided longitudinally" *read* "divided transversely."

From bottom, line 1, *for* "St. Pétersbe" *read* "St. Péterbs."

From bottom, line 7, *for* "Subsf." *read* "Subsp."

depth of tint in different individuals. As a rule small individuals are paler than large ones, but this is not always so and I have seen large ones that were quite pale. The blood is red and gives the living animal a pinkish tinge, the depth of which naturally depends on the degree of pigmentation of the integument.

My largest specimens, killed in an expanded condition, are 35 mm. long by 3 mm. broad and 2·5 mm. deep. In life they were flatter and, when at rest, distinctly broader.

Distribution.—Lake of Tiberias and neighbourhood; R. Barada. There are specimens of this race in my collection from near Damascus and from several of the springs round the lake as well from the Lake itself, in which it is one of the commonest animals.

Johansson and Rousseau both mention cases in which the stripes are faint or obsolete, but in Europe these are apparently aberrations. *Dina absoloni* of the former author entirely lacks pigment and is distinguished by the fact that the genital pores are separated by three instead of five complete rings.

Blanchard says (1893) that "*D. quadristriata*" is "*littéralement banale en Syrie.*" This I can confirm from my own observations both at Tiberias and at Damascus. In the lake I took most of my specimens on the lower surface of stones at the edge, on one occasion finding no less than 23 individuals adhering to a single stone of not more than 15·0 sq. cm. in area. In this position the food consisted mainly of small Oligochaeta, which were swallowed whole. A large but very pale individual was dredged from between 6 and 8 metres in the Jordan channel in the lake near Semakh.

No other species of leech is actually known to inhabit the Lake of Tiberias, but Blanchard in recording the occurrence of *Placobdella carinata* (Diesg.) in one of the tributaries of the R. Orontes states that Barrois took a large number of specimens, doubtless belonging to that species, on the tortoise *Clemmys caspica* in the marshes at the north end of the lake. The list of Hirudinea known from the lake must, therefore, stand for the present as follows:—

Fam. Glossiphonidae.

1. *Placobdella catenigera* (Moquin-Tandon).
2. ? ***Placobdella carinata*** (Diesing).

Fam. Herpobdellidae.

3. *Herpobdella* (*Dina*) *lineata* (O. F. Müller).

Although one of these species occurs in North Africa and even in localities outside the Palaearctic Region, they may all

be regarded as essentially representative of the European fauna. No one of them can be stated to be either Oriental or Ethiopian in origin, and they afford no evidence, except in the peculiar colouration of the race of *H. lineata* found in the Lake of Tiberias but also in the R. Barada, of long-continued isolation. The species are lacustrine and not related to marine forms.

26. A New Springtail from Galilee.

By Professor George H. Carpenter, B.Sc., M.R.I.A.,
Royal College of Science, Dublin

Communicated by Dr. N. Annandale.

(Plate VIII.)

Dr. N. Annandale's zoological researches in and around the Lake of Galilee in October, 1912, have resulted in the discovery of a single species of the Collembola or "Springtails" which proves to be of considerable interest, and I am most grateful to him for having kindly entrusted his specimens to me for study and description. He found the frail white insects, referable to a new species of the genus *Cyphoderus*, beneath stones at the edge of a brackish spring on the shores of the lake, about two miles north of the town of Tiberias.

Order COLLEMBOLA.

Family Entomobryidae.

Genus Cyphoderus, Nicolet.

The members of this genus may be recognized by the scale-covered body with excessively long fourth abdominal segment; the foot-claw with a prominent inner basal lamella or tooth (fig. 3*a*); the empodial appendage or inferior claw (fig. 3*c*) with three lamellae; and the very elongate *mucro* (fig. 5*m*) or terminal segment of the spring, usually about a third as long as the *dens*, or second segment, to which it is jointed; and by the presence of a series of large and conspicuous scales along the dorsal or hinder edge of the dens. Most of the species of *Cyphoderus* hitherto known, inhabit the nests of ants or termites, and in correspondence with their dark dwelling-places, are white and blind.

Cyphoderus genneserae, sp. nov.

Length 1·5 mm. Feelers twice as long as head. Foot with apical hair tapering, not clubbed, claw with a large and a small basal tooth. Spring with dens and mucro together as long as manubrium, dens two and a half times as long as mucro; mucro with three teeth (one apical and two dorsal). Colour white.

Locality. In salt spring on lake-shore near Tiberias.

Types in Indian Museum, Calcutta.

The above short diagnosis serves I believe to define this species from others of *Cyphoderus*. As usual in this genus there is no trace of eyes. The four segments of the feeler (fig. 1) have approximately the proportional lengths, 1 : 3 : 2 : 5. In one specimen, one of the feelers has only three segments, the second of these being three-quarters as long as the terminal (fig. 2). The foot is remarkable for the replacement of the usual clubbed tenent hair by a slender tapering bristle. In connection with the base of the foot-claw there is a small anterior tooth-like outgrowth (fig. 3, 4, *b*) in addition to the prominent hinder one, which characterises this genus generally (fig. 3, 4, *a*). The lamella of the claw has no teeth. The empodial appendage or "inferior claw" has the three characteristic lamellae very distinct, the inwardly and forwardly directed one (fig. 3, 4, *c*) being pointed and leaf-like. The fourth abdominal segment is four and a half times as long as the third. The dens of the spring (figs. 1, 5) has six pairs of rather narrow scales (fig. 5*d*), arranged along the two sides of its dorsal or hinder edge, and a large broad scale (fig. 5*e*) inserted close to the base of the mucro. The latter structure (fig. 5*m*) has three prominent teeth, one terminal, which is slightly hooked, and two dorsal.

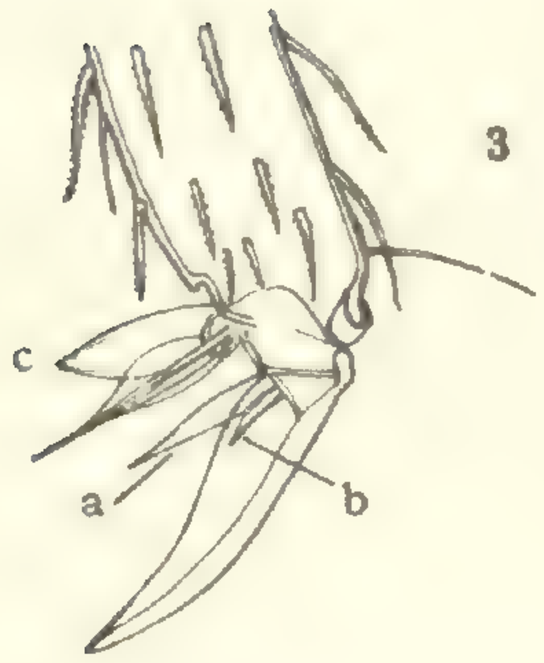
In the presence of three teeth on the mucro, *C. genneserae* differs from the European species *C. albinus*, Nic., and from the Burmese *C. simulans*, Imms (1, pp. 115–6, pl. xii, figs. 90, 91), lately described, in both of which the mucro has only two teeth. In two of the species of *Cyphoderus* recorded by Wahlgren (2, pp. 18–20, figs. 34–8) from the valley of the White Nile, we find, however, a similarity of the mucro to that of the present species. *C. sudanensis*, Wahlgren, has a large and a very minute dorsal tooth, while *C. termitum*, Wahlgren, has, in addition to the three teeth of *C. genneserae*, a minute, anterior dorsal tooth.

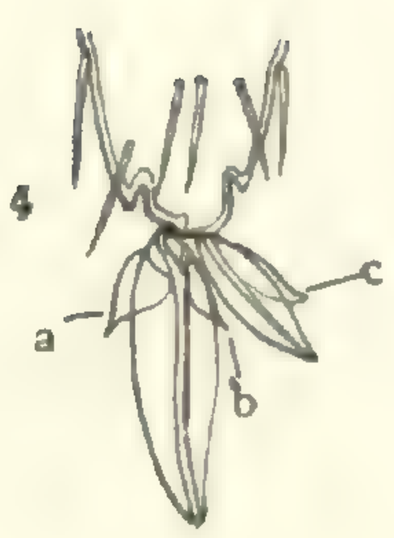
In both these Sudanese species, however, the lamella of the foot-claw is conspicuously toothed, and the large scales on the dentes are not transversely striated. Any marks of affinity between those Ethiopian and this Galilean species of *Cyphoderus* are of interest in view of the many well-known correspondences between the flora and fauna of the Jordan valley and those of tropical Africa.

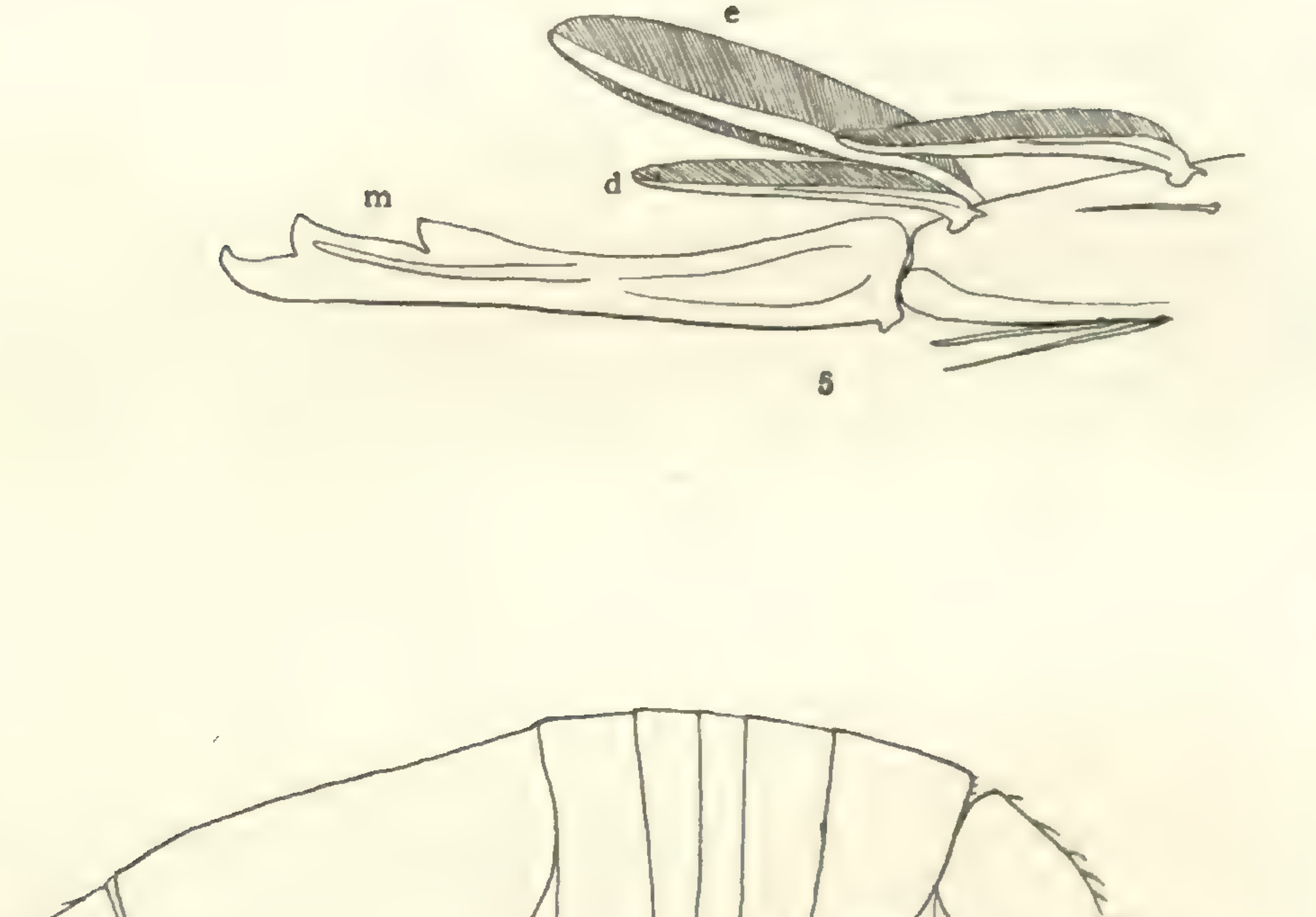
Literature.

(1) *A. D. Imms.* On some Collembola from India, Burma, and Ceylon, *Proc. Zool. Soc Lond.*, 1912, pp. 80–125, pls. vi–xii.

(2) *E. Wahlgren.* Apterygoten aus Aegypten und dem Sudan. *Results of the Swedish Zoological Expedition to Egypt and the White Nile*, 1901, no. 15, Uppsala, 1906.







Cyphoderus genneserae, sp. nov.

Plate VIII.

Fig. 1. *Cyphoderus genneserae.* Side view. × 50.

,, 2. Abnormal feeler. × 50.

,, 3. Tip of fore-foot: side view showing claw with its two tooth-like basal lamellae (*a* and *b*) and empodial appendage with leaf-like lamella (*c*). × *ca.* 466.

,, 4. Tip of middle foot, outer view; lettering as in fig. 3. × *ca.* 466.

,, 5. End of dens, with paired (*d*) and terminal (*e*) scales, and mucro (*m*). × *ca.* 466.

27. Note on the Dragonflies of Syria and the Jordan Valley.

By F. F. Laidlaw, F.Z.S., F.E.S., F.L.S.

Communicated by Dr. N. Annandale.

[The two dragonflies (*Trithemis annulata* and *Brachythemis leucosticta*) identified by Mr. Laidlaw, are very common on the Lake of Tiberias in October. No other species approaches them in abundance round its shores in open country, but among the dense vegetation that surrounds many of the pools and streams in the vicinity several species of Agrionidae are to be found in fairly large numbers.—*N. Annandale.*]

The Odonata of Syria and of the Jordan Valley are still imperfectly known.

Two elements at least enter into the composition of the dragonfly fauna: firstly, species belonging to the Mediterranean province and, as might be expected, more particularly to the eastern division of the region. Such species are some of the members of the genus *Orthetrum*, which has several representatives recorded from Syria, as well as the species of the genus *Sympetrum* occurring in the area under discussion.

Secondly there occur a number of species belonging to the tropical old world fauna, and more especially to the African region. Such are the two species of which examples were collected by Mr. Annandale, viz. *Trithemis annulata* (Palisot de Beauvois) and *Brachythemis leucosticta*, Burm.

Both these species belong to genera which are abundant in the tropical parts of Africa and of the Oriental region and are characteristic of them; each of the species has a very wide range,—from West Africa probably to the Euphrates Valley.

Crocothemis erythraea and *Orthetrum chrysostigma*, Burm. stand in the same category.

In a recent paper by Martin (Bull. Soc. ent. France, 1909-12, pp. 212-14) two species are noted as occurring in the neighbourhood of Damascus which point to the probable existence of a third more eastern factor in the fauna. These species are *Anax immaculifrons*, Burm. described from Tonkin and Indo-China; and *Psilocnemis kervillei*, Martin, a new species belonging to a characteristic Indo-Malayan genus, which is, however, represented in Madagascar, and is exceedingly closely related to the Mediterranean *Platycnemis*.

Ris has recently published an analysis of the known

dragonfly fauna of the Egyptian Soudan. He groups the species as follows :—

1. *Palaearctic* ; 2. *Palaearctic-Mediterranean* ; 3. *Aethiopian*, with *Northern* extension ; 4. *Typical Aethiopian* ; 5. *Aethiopian* with *Eastern* extension ; 6. *Oriental* (reaching only to Suez) ; 7. *Circumtropical-cosmopolitan* (Sitzungsb. kaiserl. Akad. Wissenschaft Wien ; mathem.-naturw Klasse : Bd. cxxi, Abt. 1 ; April, 1912).

Probably all of these except 4 will be found to be represented in the Jordan Valley and Syria ; possibly even group 4 may be present.

Mr. Annandale's two species on this classification fall most naturally into group 5.

28. Note on a Sponge-Larva from the Lake of Tiberias.

By N. Annandale, D.Sc., F.A.S.B.

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(Plate VII, fig. 3.)

In a small aquarium which I kept at Tiberias I found on October 22nd certain little organisms which I took at the time for the larvae of Phylactolaematous polyzoa. As they differed considerably in form and size from those of *Fredericella sultana jordanica*, several colonies of which were living in the aquarium, I was at a loss to account for their presence. A subsequent examination of preserved specimens, however, proved them to be sponge-larvae, and as *Nudospongilla mappa* was the only sponge living in the aquarium and as sponges of the species were actually full of embryos at the time in the lake, there can be no doubt that the larvae belonged to that species.

The larvae were in life of a milky white colour, with a more opaque patch (representing the solid part of the organism) clearly visible with the aid of a hand lens at one end. They moved slowly through the water by means of the cilia that covered them and often swam in wide circles, although they did not gyrate on their longer axis as the larvae of Phylactolaemata usually do. Their form was very broadly ovoid, approaching the spherical The broader end was directed forwards. In structure they closely resemble the larvae of *Spongilla*, consisting of a fine external membrane formed of a single layer of ciliated epithelium lined with one of flattened embryonic cells and containing at one end a mass of cells that stain more darkly than those of the epithelium and already exhibit a certain amount of differentiation among themselves. The greater part of the organism is hollow and the whole bears a remarkable external resemblance, and indeed a remarkable functional analogy to the Phylactolaematous type of polyzoon-larva. When the two larvae are seen together they might easily be mistaken for different stages in the life-history of a single organism, but of course the polyzoon is much more highly organized than the sponge at the time each is set free.

The larva of *Nudospongilla mappa* is, in the case of preserved specimens, about 0·44 mm. long by 0·40 mm. wide. A little more than half of the bladder-like body is hollow, the remainder being filled with the primitive dermal cells. Amongst these latter certain cells have already taken on the function of

scleroblasts, and, indeed, spicules are already well developed and have begun to be arranged in fascicles or fibres.

In the specimen figured a certain distortion of the narrower end has been brought about by shrinkage in the preservatives used (picro-formol-acetic solution followed by 90% alcohol) and it is probable that the projection of one fascicle of spicules through the ciliated membrane is not natural.

The main interest of the larva of *Nudospongilla mappa* lies in the fact that it is precisely of the Spongillia-type; for it is by no means certain that all the possibly heterogeneous species which I have assigned provisionally to the genus have a common origin; the skeleton of *N. mappa* in particular is so like that of some species of the Renierine genus *Petrosia* that a direct instead of a convergent relationship might have seemed probable in the absence of embryonic evidence. As it is, it may be claimed with confidence that *N. mappa* at any rate is a true Spongillid, for its larva hardly differs from that of *Spongilla* except in being more nearly spherical. Advanced embryos of the species of *N. reversa* and of *Cortispongilla barroisi* all seem to be very similar in structure, but it is much more satisfactory to distinguish the type to which a sponge-larva belongs, after it has been set free.

Plate VII, fig. 3.

Fig. 3. Larva of *Nudospongilla mappa* Annand., × 100.

The specimen had been stained with picro-carmine and mounted, after clearing, in Canada balsam.

29. The Polyzoa of the Lake of Tiberias.

By N. Annandale, D.Sc., F.A.S.B.

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(Plate VII, figs. 1, 2.)

Although a careful search for Polyzoa was made and a large number of specimens obtained, only two species are represented in my collection from the Lake of Tiberias. I have called them

Fredericella sultana jordanica, subsp. nov.,
and *Plumatella auricomis*, sp. nov.

The former is interesting as being intermediate in structure between the typical European race of the species and that found in Peninsular India, while the latter differs in more than one important character from any other species hitherto critically examined.

Fredericella sultana jordanica, subsp. nov.

This race differs from the typical *Fredericella sultana* (Blumenbach) in the following characters :—

1. Even when growing luxuriantly, the colony does not form free branches of more than two zooecia.
2. The ectocyst is usually quite colourless, but in old colonies the covering of some zooecia situated in the oldest part is often thick and dark.
3. The zooecia are never circular in cross-section but always possess a strong dorsal keel containing a longitudinal furrow.

These characters are not, in my opinion, of specific value, but as they are constant in a large number of specimens examined both in the field and the laboratory, they may be accepted as racial or subspecific.

The colony often covers a considerable area and recumbent branches are sometimes closely pressed together and even overlap, but without forming upright or pendulous stems. The ectocyst of young zooecia, compared with that of similar zooecia in colonies examined from England, Scotland, Germany, Canada and the Himalayas (Kumaon), is unusually pale, but its darkening and thickening in parts of old colonies is often a striking feature. The diameter of the zooecia varies considerably. As a rule they are distinctly flattened on the lower surface. The keel and furrow are particularly well marked on old zooecia,

but even on young branches can as a rule be detected. They become clearer in disintegrating zooecia the polypide of which has died.

The polypide resembles that of the typical race, except that the tentacles, about 20 in number, are perhaps longer. The velum at their base is very narrow but distinctly festooned.

The statoblasts are smooth on both surfaces and in other respects resemble those of European colonies; but they are perhaps as a rule more elongate and less frequently kidney-shaped. They are more numerous in some colonies than is usual in the European race.

The type of *Fredericella sultana jordanica* is preserved in spirit in the Indian Museum, its number in our registers being Z. E. V. $\frac{5451}{7}$.

Having now had the opportunity of examining a considerable number of living colonies of *Fredericella* in Scotland, I am convinced that I was wrong in identifying the form found in Kumaon [1] by Mr. Kemp with the Peninsular Indian race (*indica*), which has been reported from Travancore, the Bombay Presidency, and Orissa. Indeed, the Himalayan race resembles the typical European one so closely that I cannot separate them. It has not the ornamented statoblasts of *indica* and is of much more luxuriant growth, while the ectocyst has a darker colour.

The differences between the European race and *indica*, although constant, are unimportant, and I think it will be better to regard the two as conspecific.

Fredericella cunningtoni Rousselet [2] is perhaps a distinct species, but has not been studied in detail. It is only known from Lake Tanganyika, and I have not examined specimens.

The following table illustrates concisely the more important peculiarities of the different races of *F. sultana*, so far as they can be distinguished at present:—

Forma typica.	*Indica.*	*Jordanica.*	*Duplessisi.*
Colony, when luxuriant, with long free branches, adherent at its base.	*Colony* recumbent, adherent.	*Colony* recumbent, adherent.	*Colony* free in mud.
Zooecia almost cylindrical, with a slight dorsal keel on older zooecia.	*Zooecia* with dorsal keel and furrow more or less distinct.	*Zooecia* with dorsal keel and furrow well developed.	*Zooecia* almost cylindrical.
Statoblast with both surfaces smooth.	*Statoblast* with one surface sculptured.	*Statoblast* with both surfaces smooth.	*Statoblast* unknown.

[1] *Faun. Brit. Ind., Freshwater Sponges*, etc., p. 245 (1911), and *Rec. Ind. Mus.* VII, pp. 136, 140 (1912).

[2] *Proc. Zool. Soc. London*, 1907 (*i*), p. 254.

F. sultana (typical) is found all over Europe, in the Western Himalayas, in North America, and probably in North Africa; possibly also in Natal. *F. australiensis*[1] from New South Wales has been described as a distinct species by Goddard, but the chief characters on which he bases his diagnosis are not of a constant nature in other forms. I am inclined to regard this form as a local race distinguished from that of Europe and N. America by the total absence of a keel on any of the zooecia. I have not, however, seen specimens of *Fredericella* from Australia.

F. sultana jordanica has only been found in the Lake of Tiberias and in the R. Jordan at its exit therefrom.

F. sultana indica, although scarce, is apparently of general distribution in the Indian Peninsular area.

F. sultana duplessisi was obtained from considerable depths in the Lake of Geneva. It is doubtful whether it is more than a phase of the typical form that lives free in mud. The only specimen I have seen supports Loppens's contention[2] that it only differs from the typical form in that it is not fixed to any solid object; but this specimen, which was shown me by Mr. C. Rousselet in London, was imperfect, and no statoblasts have as yet been discovered.

In October, 1912, I found *F. sultana jordanica* abundant on the lower surface of stones round the edge of the Lake[3] of Tiberias. I also noticed many dead colonies in a similar position above the autumn water-level. Colonies were also found, but much less sparingly, on the roots and stems of water-weeds (*Ranunculus*) in about a metre of water. At greater depths than this they were rare on stones, and I did not obtain specimens below 8 metres. I could find none free in mud; but some of the stones on which old but apparently vigorous colonies grew were half buried in the dense silt that covers the bottom of the lake where it is not concealed by stones. Occasionally the Polyzoon was observed on small stones in well-protected situations, but as a rule it occurred only below those of considerable size. Its retiring habits were evidently necessary for its protection, for I noticed that it was immediately attacked and devoured by young fish of the genus *Tilapia*, which existed in large numbers in the shallows of the lake, as soon as it was exposed by a stone being turned over.

Free-swimming larvae of *Fredericella* were obtained among weeds at the edge of the lake on several occasions in October, and others were produced by colonies living in a small aquarium. They were about 0·9 mm. long and of a milky white

[1] *Proc. Linn. Soc. N. S. Wales* XXXIV, p. 489 (1909).
[2] *Fide* Zschokke, *Die Tiefseefauna der Seen Mitteleuropas*, p. 100 (1911).
[3] *Cf.* Barrois, *Rev. biol. Nord du France* vi, p. 289 (1894).

colour. In progression the broader (morphologically posterior) end was directed forwards. Their movements were comparatively slow and they did not gyrate on their long axis so frequently as the larvae of *Pectinatella burmanica*,[1] which they resembled closely in appearance. In structure they agree with normal larvae of the typical race as described by Braem,[2] but the apical mass of nerve cells at the "posterior" extremity appears to be larger than his figures[3] would suggest and the cavity within the external membrane is decidedly greater. The larvae refused to settle on the walls of the aquarium or on the stones and weeds it contained, probably on account of the high temperature of the room.

While some colonies from the lake, more particularly those from stones, contained statoblasts in October, others had none, or only a few in an early stage of development. The thickening of the ectocyst in parts of old colonies is a feature of great interest and appears to be correlated to some extent with the production of statoblasts and to form an extra safeguard for their protection. The process takes place only at or near the oldest part of colonies of considerable size in which many of the polypides have degenerated; the zooecia affected contain as a rule mere remnants of the animal, together with several statoblasts. Occasionally, however, the furrow on the dorsal surface gapes so widely open that the statoblasts escape. Young branches with living polypides are often found growing out of these dead zooecia. The whole structure suggests an analogy to the resting buds of the Paludicellidae, if not an actual homology with them; but there is this difference, that whereas in the resting bud each mass of reproductive cells has its own impermeable covering, the special reproductive zooecia of *F. sultana jordanica* each contain several analogous masses, with as many impermeable envelopes. In the case of the resting bud, the special structures necessary for its protection are as a rule produced outside the zooecium,[4] and its own envelope is homologous with the ectocyst of a single zooecium; while in the case of the peculiar structures here discussed, the statoblasts, which may be described as internal resting buds, are produced within a zooecium, the wall of which is homologous with the envelope of the external resting bud, and becomes also to some extent analogous to it by growing thick and dark. All statoblasts, even in this race of *F. sultana*, are not produced in zooecia with thickened walls; but it seems

[1] Annandale, *Faun. Brit. Ind.*, *Freshwater Sponges*, etc., p. 237.
[2] *Bibliotheca Zool.*, XX, pt. 52, p. 29 (1908).
[3] *Op. cit.*, pl. vi, figs. 44. 45, 46, and 50.
[4] But see *Faun. Brit. Ind.*, *tom. cit.*, pp. 170, 198. In *Victorella bengalensis* it is apparently possible for zooecia to be metamorphosed directly into resting buds. In this case the homology is more nearly, though not absolutely complete, for each zooecium may form a single bud.

generally to be the case that if the walls of a zooecium containing statoblasts persist after the polypide has degenerated, they tend to become specialized in this way.

Plumatella auricomis, sp. nov.

Colony small, recumbent, with short horizontal branches closely pressed together.

Zooecia short, stout, L-shaped, cylindrical, with no trace of a dorsal keel or furrow; ectocyst greatly thickened, colourless, hyaline, stiff and neither contractile nor capable of being thrown into furrows by the retraction of the polypide.

Polypide slender, deeply pigmented, the alimentary canal being of a deep orange-brown, darker on the stomach than elsewhere; base of lophophore tinged with the sameshade; tentacles pale golden yellow, long, slender, comparatively few in number; velum at their base very narrow.

Statoblasts. No free statoblasts were observed. One colony contained a single fixed statoblast, which is narrowly oval, its capsule being about $\frac{2}{3}$ as long as wide, and is surrounded first by a solid but slender chitinous ring and then by an irregular chitinous margin containing minute air-spaces. This margin also infringes on the dorsal surface of the capsule, which, where free, is covered with very minute scattered tubercles.

Habitat.—Lake of Tiberias, Palestine.

Type.—Z. E. V. No. $\frac{5\,1\,5\,3}{7}$, Ind. Mus.

Unfortunately the material at my disposal is so scanty and so imperfect that I am unable to give a fuller description or an adequate figure. Only two colonies were found, and one of them was not observed until it had been plunged in spirit. The other was carefully narcotized and fixed, but I find on re-examining it after some months that it is not in much better condition than the other. The species, however, is distinguished from all others that have been described by two important characters, the thick, hyaline, stiff ectocyst without a dorsal keel furrow and the yellow colour of the lophophore. The latter is a feature, so far as I am aware, unique in the Polyzoa. The ectocyst is much thicker than in *Plumatella javanica* and differs from that of *P. punctata* in not being soft and contractile. It shrivels greatly in spirit. My description is based mainly on field notes.

Both colonies were dredged in between 6 and 8 metres of water in the channel of the R. Jordan as it flows through the south end of the lake between the village of Semakh and its exit, and both were attached to shells of *Unio terminalis.* One, the larger of the two, was growing at one end of one shell of a living mollusc, just outside the siphonal aperture; the other, which contained the only statoblast seen, was fixed to

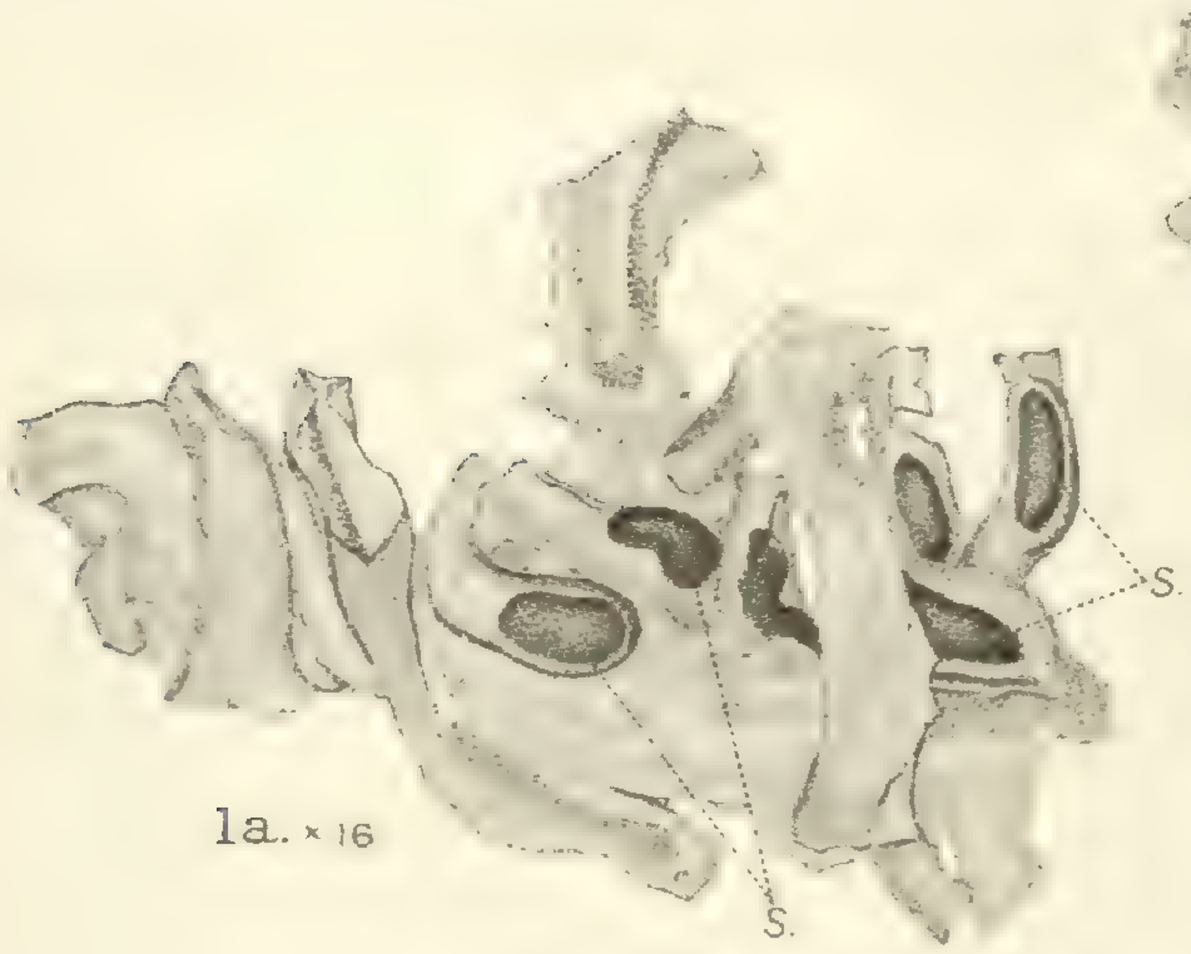
the inner surface of a dead shell. As shells of all kinds decay rapidly in the water of the lake. it was probably young. The statoblast was empty, although the valves did not gape; possibly the colony had originated from it. Statoblasts in every respect similar, except that they were full of cells and apparently ready to patch in favourable circumstances, were found on the lower surface of a stone in the stream of the Wad-es-Semakh near the eastern shore of the lake; but the fixed statoblasts of *Plumatella* rarely provide specific characters that can be trusted, and I cannot be sure of specific identity in this case.

I have to thank Dr. J. H. Ashworth for seeing the plate that illustrates this paper, as well as other plates in the series, through the press. The figures have been drawn by Babu A. C. Chowdary with his usual skill.

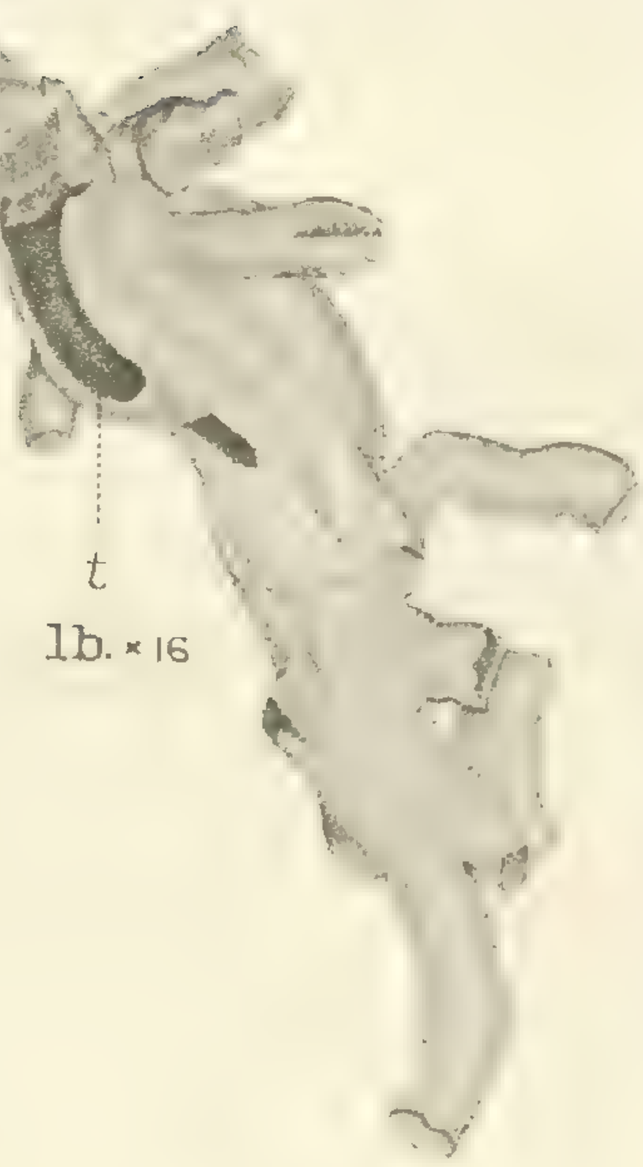
Plate VII, figs. 1 and 2.

Figs. 1, 1*a*, 1*b*, 1*c*.—*Fredericella sultana jordanica*, x 16. 1.—Distal part of the type-colony in spirit. 1*a*.—Basal or proximal part of older colony scraped from stone as seen from below, the base of most of the zooecia being removed. 1*b*.—Another part of the same colony as seen from the side. 1*c*.—Proximal part of another colony rendered transparent to show three zooecia enclosed in dark and thickened ectocyst; a young branch is growing out of the degenerate zooecium: *s* = statoblast: *t* = thickened and dark ectocyst of old zooecium containing statoblasts.

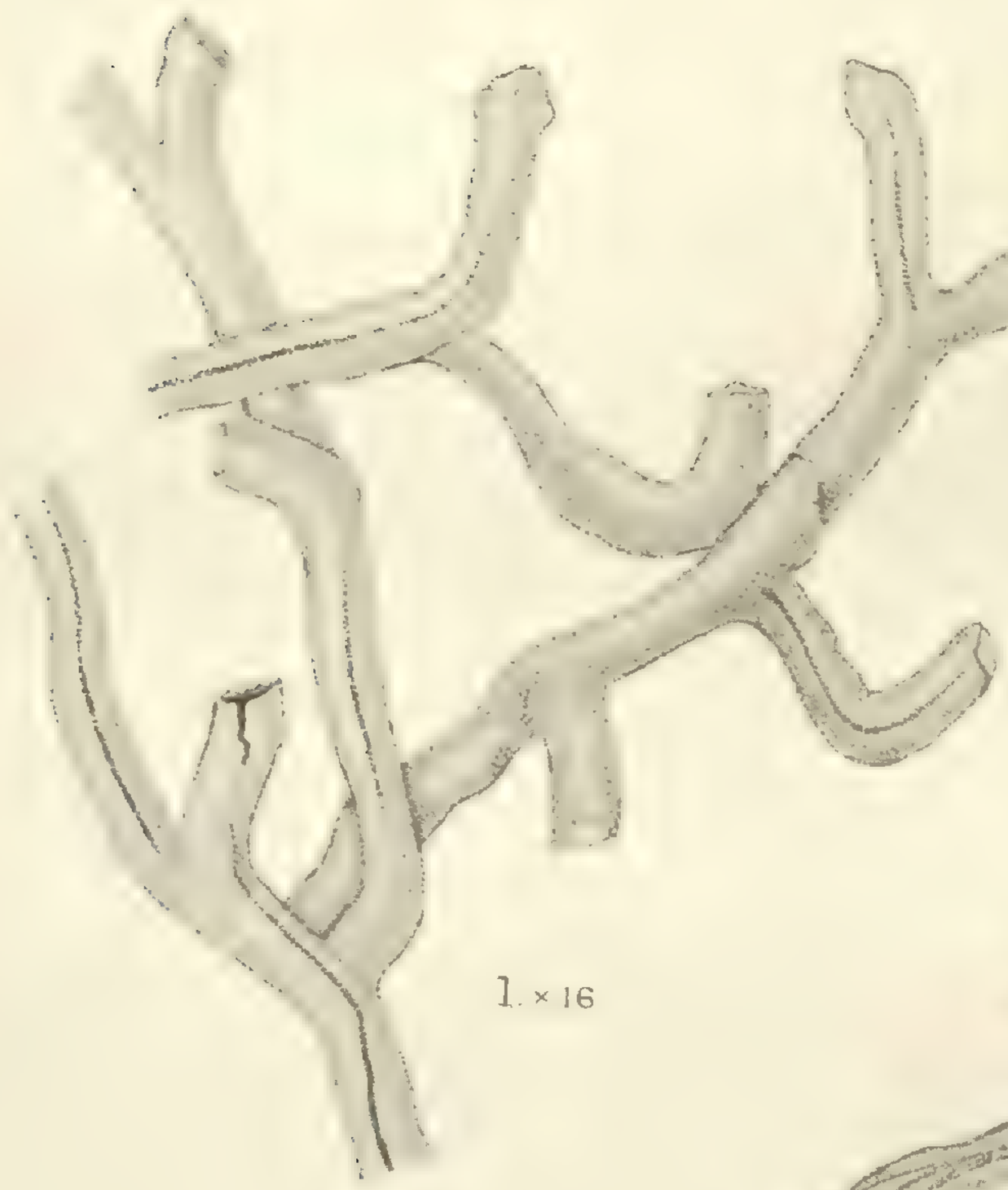
Fig. 2.—*Plumatella auricomis*: fixed statoblast, × 75.



1a. × 16



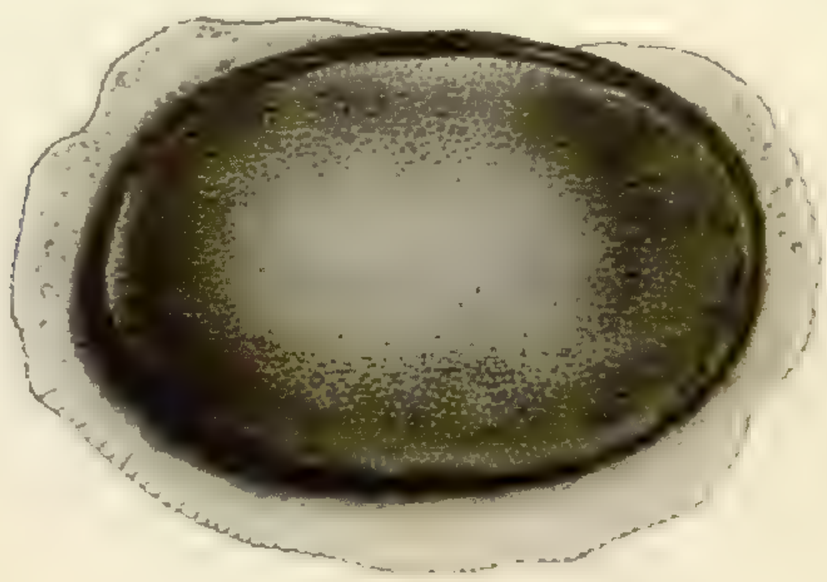
1b. × 16



1. × 16

1c. × 16

3. × 100



2. × 75

A.C. Chowdhary, del.

Bemrose, Colls., Derby

POLYZOA AND SPONGE—LARVA FROM GALILEE.

30. A Note on Rotifers from Galilee.

By C. F. Rousselet, F.R.M.S.

Communicated by Dr. N. Annandale.

[During my visit to Galilee, in October, 1912, I made no special attempt to collect Rotifera, but specimens of several species have been found by Mr. Rousselet in a tow-netting from the surface of the Lake of Tiberias, and two others have appeared in large numbers in a bowl of water containing mud from the bed of the little pool known as Birket Meskana and situated half way between Tiberias and Nazareth. As the number of rotifers known from Syria and Palestine is small, a list of these species is here published.—*N. Annandale.*].

A. Species taken near the surface of the Lake of Tiberias.

1. *Brachionus militaris*, Ehrenberg. [Abundant on the surface of the lake both by day and night throughout the greater part of October, 1912.—*N. A.*]

2. *Asplanchna brightwellii*, Gosse. A few specimens.

3. *Anuraea valga* Ehrenberg. One specimen in the stomach of *Asplanchna.*

4. *Conochilus dossuarius*, Hudson. Two specimens.

Brachionus militaris does not occur in England, but is not uncommon in Germany, China, Ceylon, S. Africa, N. America, S. America, and Canada.

Asplanchna brightwellii is common in England.

A few Bdelloid Rotifers, fully contracted and not identifiable, were also found in the tow-netting.

B. Species reared in Calcutta from dried mud.

[A handful of dried mud from the bed of the Birket Meskana, then completely dry, was taken on October 10th and brought to Calcutta, where, on November 27th, it was placed in a large glass bowl of filtered water. After an interval of some weeks a considerable number of small Entomostraca appeared and shortly after Christmas it was noticed that two species of sessile Rotifera were already abundant on the glass. No similar organisms were to be found in a second bowl standing beside the first and containing mud from a second locality and water from the same supply. The second locality was a small pool at the edge of the Lake of Tiberias. Both species of

Rotifera disappeared after a few weeks and neither has since (in April) re-appeared. Mr. Rousselet has sent the following note on them.—*N.A.*]

Oecistes socialis, Weber.

This species was first discovered by Dr. Weber in the neighbourhood of Geneva and described by him in his paper "Rotateurs des Environs de Genève," *Arch. de Biologie* 1888, and afterwards he gave a better and fuller account in his greater work, "Les Rotateurs du Bassin du Léman," *Revue Suisse de Zoologie* V, 1898.

The animals secrete gelatinous tubes which become agglomerated into a rounded gelatinous ball as much as 5 mm. in diameter and containing thousands of individuals. In recent years the species has also been found by Dr. de Beauchamp in the neighbourhood of Paris (in 1901), and John Shephard found it in Victoria, Australia, and gave it the name of *Lacinularia elongata* (1896). In England I have obtained it once from Dundee.

The species is however a rare one, not often seen.

Limnias ceratophylli, Schrank.

This is a well-known and fairly common Rhizote or fixed, tube-dwelling Rotifer, found in many parts of the world. When very abundant and under favourable food conditions, the young frequently attach themselves and fix their tubes to the parents in a very irregular fashion. All particulars as to their anatomy will be found in Hudson and Gosse's monograph. It is a quite cosmopolitan species.

31. Entomostraca from the Lake of Tiberias.

By Robert Gurney.

Communicated by Dr. N. Annandale.

The collections of Entomostraca submitted to me by Dr. Annandale were chiefly plankton samples from Lake Tiberias itself, but included also three bottles containing specimens from small pools near the Lake. In addition to these collections I have had the opportunity of examining specimens hatched either in Calcutta or here in England from mud taken by Dr. Annandale from other similar pools.

The plankton of Lake Tiberias seems to be very uniform and to consist of the following species :—

Cladocera.

Diaphanosoma brachyurum, Liévin,
Ceriodaphnia reticulata, Jurine,
,, *rigaudi*, Richard,
Bosmina longirostris var. *cornuta*, Jurine.

Copepoda.

Cyclops leuckarti, Claus.

All the collections, whether taken by night or by day, contained an abundance of Copepods, nearly all of them immature. The few mature specimens found were all of the one species, *C. leuckarti*.

The Cladocera seem to show some diurnal migration, since they are far more numerous in the night collections than in those taken during the day. The latter consist almost entirely of immature Copepods.

The plankton taken by Dr. Annandale in October scarcely differs from that described by Dr. Barrois, who visited the Lake in May.[1] He found precisely the same species, with the addition of *Daphnia lumholtzi*, which he notes is confined to the deeper waters and was only once found at the surface. He also found the majority of the Cyclops of the plankton to be immature.

The other collections made by Dr. Annandale were as follows :—

(1) Ain-et-Tineh. Townetting in a small pool full of Ranunculaceous water-weeds. 7-x-12.

Cyclops serrulatus, Fischer.
A few ostracod shells.

[1] Barrois, Rev. biol Nord France, VI, 1894, p. 284.

(2) Wad-es-Semakh. Small dirty pool on the shore of the Lake; no Phanerogamic vegetation. 13-x-12.

Macrothrix laticornis, Jurine.
Cyclops macrurus, Sars.

(3) Townetting in the Octagonal Pool at et-Tabghah. 7-x-12. *Bosmina longirostris.* A few dried, shrunken specimens.

The following species were hatched from mud taken from a dried pool called Birket Meskana in the hills between Tiberias and Nazareth.

PHYLLOPODA.

Estheria gihoni, Baird.

CLADOCERA.

Daphnia similis, Baird.

COPEPODA.

Diaptomus similis, Baird.

OSTRACODA.

Cyprinotus dentatomarginatus, Baird.
,, *salina*, Brady.
Eucypris virens, Jurine.
Cypris pubera, Müller. var.
Ilyocypris gibba, Ramdohr.

Nearly all the specimens hatched from this mud and submitted to me were somewhat immature, and I am in some doubt as to those which I have named as *C. pubera*, since they differ considerably from the type. I hope to be able to hatch these Entomostraca myself and to examine them further during the summer.

32. On the Internal Anatomy of the Blind Prawn of Galilee (*Typhlocaris galilea* Calman).

By Ekendranath Ghosh.

(Plates XV—XVI.)

The material at my disposal in drawing up the following notes consists of two specimens, an adult male and an adult female, brought by Dr. N. Annandale, Superintendent of the Indian Museum, from the pool near the edge of the Lake of Tiberias in which the species was originally found. The specimens were fixed in picro-formol-acetic solution and preserved in 90% alcohol. In one a slit had been made at the base of the two ocular peduncles to allow the fixative to penetrate. They were in excellent condition for histological investigation.

The anatomy of the present animal resembles that of the type-genus (*Palaemon*) of the same family in most of its salient features. Consequently, it has been considered best to compare the anatomy of these two genera, taking to represent the latter the common freshwater prawn (*P. carcinus*) available in Calcutta.

Digestive system. The digestive system of *Typhlocaris* differs from that of *Palaemon* in a few minor points only.

The cardiac portion of the stomach in *Typhlocaris* is divided into two portions, the posterior one of which forms a sort of cul-de-sac separated from the anterior division by an oblique groove extending from the dorsal surface of the organ obliquely downwards and forwards to the base. The posterior division overlies the pyloric chamber and projects behind beyond the latter. The groove is represented in *Palaemon* by a slight constriction in the same position. This groove corresponds to a tongue-shaped flap of integument in the cavity of the cardiac chamber (anterior division) overlying the opening into the pyloric chamber. In *Palaemon* the flap is represented by a mere thickening of the wall corresponding to the groove. The hastate plate in the floor of the cardiac chamber is broader than that in *Palaemon* and the chitinous ridge on either side of the plate is not beset with hair as it is in the allied genus. Above these ridges are fleshy folds, which are overlapped behind by the tongue-shaped fold just mentioned; they are present also in *Palaemon*.

The liver differs from that of *Palaemon* both in size and shape, as follows :—

Typhlocaris.	*Palaemon.*
1. The liver is elongated, and extends from behind the oesophagus beneath the endosternite to the first abdominal segment.	The liver is less elongated, and does not extend beyond the cephalothorax.
2. There is a round hump-like prominence on the dorsal aspect situated above the attachments of the second and third peraeopods.	The hump is less prominent.
3. Behind the hump, the liver extends to the first abdominal segment in the form of a prominent beak-like process, being separated from the hump by a saddle-shaped concavity on the dorsal aspect.	The liver slopes backwards and a little downwards behind the hump and terminates in a blunt end with a median groove on the postero-ventral aspect.

In both genera the intestine presents a bulbous swelling just before it ends in the anus.

Vascular system. The pericardium is triangular in shape, being a little narrower than that of *Palaemon*. It occupies a little less than the posterior half of the cephalothorax, while in *Palaemon* it extends over a little more than the posterior third of the length.

The heart occupies the middle of the pericardial chamber. The dorsal surface presents a ridge in the middle line. The ventral surface rests on the genital organs and on the liver at the sides. There seem to be two pairs of ostea, both placed on the dorsal surface of the heart. These correspond to the second and third of the five pairs of ostea present in *Palaemon*. The anterior pair lie behind a rounded prominence in the anterior portion of the dorsal surface. The posterior pair lie at the posterior border of the dorsal surface.

The heart is connected with the pericardial wall by four strands of connective tissue which are disposed as follows :—

(1) A pair of broad flattened strands, one on either side, arising from the side of the heart in its posterior two-thirds and passing obliquely backwards and outwards to be attached to the lateral wall of the pericardium.

(2) A pair of narrow strands, one on each side, arising from the antero-lateral aspect of the heart behind the origin of

the antennary artery and passing outwards and a little forwards to be attached to the pericardial wall on its ventro-lateral aspect.

The origin and distribution of the main arteries in *Typhlocaris* agree closely with that in *Palaemon*, with the following exceptions :—

	Typhlocaris.	*Palaemon.*
1. Ophthalmic artery.	Well developed, traced quite easily to the base of the ocular peduncles where it is seen to divide into two branches.	Very poorly developed; scarcely to be traced beyond the stomach even in injected specimens.
2. Antennary artery.	Same in both.	
3. Hepatic .. arteries.	Arise from the lateral aspect of the ventral surface at its posterior border.	Arise from the extreme anterior end of the ventral surface just behind the apex and closer to the middle line.
4. Dorsal .. abdominal artery.	Same in both.	

A fine muscular strand, described as the gastro-cardiac muscle in *Palaemon* (3), is also present in *Typhlocaris.*

Reproductive system. *Male.* The testis is quite different in shape from that of *Palaemon.* The two testis lie close to each other so as to form a single pentagonal mass lying on the dorsal surface of the liver and projecting forwards from beneath the heart. Anteriorly the mass seems to be connected with the dorsal renal sac (?) lying over the stomach. The vas deferens begins from the postero-external aspect of the testes and forms a close coil which constitutes an irregular mass at their hinder end. It then passes outwards and down the outer surface of the liver to end in the external genital aperture placed at the base of the last peræopod.

Female. The ovaries, like the testes, are different in shape from those of *Palaemon.* They are placed close to each other so as to form a flattened elongated triangular mass lying over the dorsal surface of the liver. The base of the body lies in front and is connected to a thin triangular membrane which

seems to be continuous with the dorsal renal sac. The mass is bent on itself antero-posteriorly so to form a bow-shaped body with the concave surface upward. The dorsal surface of the organs is connected with the floor of the pericardium, the heart lying in the concavity of the organs.

The oviduct arises from the outer side of each ovary on the dorsal aspect at the junction of the anterior one-third and posterior two-thirds of its length. It passes outwards and downwards over the surface of the liver to the genital aperture placed at the base of the third peraeopod.

The difference between the genital organs of the two genera may be tabulated as follows :—

	Typhlocaris.	*Palaemon.*
1. Testes ..	A single compact mass, pentagonal in shape, lying in the thorax beneath the heart and projecting a little in front of the latter.	Two narrow elongated bodies connected with one another in the middle of their lengths, and extending from behind the stomach to the first abdominal segment.
2. Vas deferens	The coils placed just behind the testes forming a compact mass.	The coils less close and placed on the outer side of the testes quite separate from it.
3. Ovaries ..	The ovaries form a compact triangular mass with the base forwards.	The ovaries are elongated fusiform bodies placed close to each other.

Nervous system. The nervous system of *Typhlocaris* agrees closely with that of *Palaemon* except in a few details corresponding to the degenerate condition of the eyes. The differences may be noted in the following table :—

	Typhlocaris.	*Palaemon.*
Cerebral ganglia.	Oval in shape, placed close to each other just inside the posterior ends of the ocular peduncles.	Relatively smaller and placed outside the ocular peduncles inside a hollow semi-cylindrical chitinous structure placed beneath the junction of the rostrum and the carapace, and connecting the bases of the two ocular peduncles.
Nerves from the cerebral ganglia—		
(1) Optic nerve	A fine nerve.	A stout nerve.
(2) The nerve to the first antenna	A stout nerve.	Finer than (1).
(3) The nerve to the second antenna	Intermediate in thickness between (1) and (2).	Of the same size as (2).

Structure of the ocular peduncle.—There is no trace externally of visual structure in the ocular peduncles.

Minute structure.—The ocular peduncle consists of the following layers, from without inwards:—

(1) A thick layer of cuticle, the outer portion of which is homogeneous, and chitinous in structure, while the inner portion is finely laminated. The cuticle is thicker at the sides than towards the tip.

(2) The core of the peduncle consists of a mass of cells which undoubtedly represents the optic ganglion. The cells are irregular in shape, with round nuclei—mostly eccentric in position; those beneath the cuticle are multipolar, and are small in size, being more compact in arrangement than those placed towards the centre. The cells are separated from one another in many places by small irregular spaces which are also continued into the outer surface of the ganglionic mass between it and the inner surface of the cuticle. No trace of ommatidia is seen in the sections. F. H. Pike (4) has described a similar condition in the degenerate eyes of *Palae-*

monetes eigenmanni, Hay. In this species, however, he found a trace of nerve fibres which have not been found in the present animal.

LITERATURE.

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2. Calman, W. T., "Crustacea," in Lankester's Text-book of Zoology.
3. Lloyd, R. E., Introduction to Biology for Indian Students.
4. Pike, F. H., Degenerated eyes of "*Palaemonetes eigenmanni*," Hay. Mar. Biol. Lab. Bull., Woods Holl, Mass. 11, 1906 (pp. 267–276).

EXPLANATION OF PLATES XV-XVI.

Typhlocaris galilea, Calman.

FIG. 1.—Dorsal view of the cephalothorax, showing the heart, × 4; *a*, ophthalmic artery; *b*, heart; *c*, one of the anterior pair of ostea; *d*, one of the posterior pair of ostea; *e*, attachment of mandibular muscle.

,, 2.—Ventral view of heart × 4; *a*, origin of the hepatic artery; *b*, origin of the abdominal artery.

,, 3.—Dorsal view of the cephalothorax, after removal of the heart, × 4; *a*, stomach; *b*, mandibular muscle; *c*, position of the dorsal renal sac; *d*, *g*, liver; *e*, ovary; *f*, oviduct; *h*, first abdominal segment.

,, 4.—Portion of the pericardium, × 4; *a*, gastrocardiac muscle; *b*, hepatic artery; *c*, floor of the pericardium.

,, 5.—Side view of the ovary, × 4.

,, 6.—Side view of cephalothorax, × 4; *a*, liver; *b*, stomach.

,, 7.—Male genital organ, × 4; *a*, testes; *b*, vas deferens.

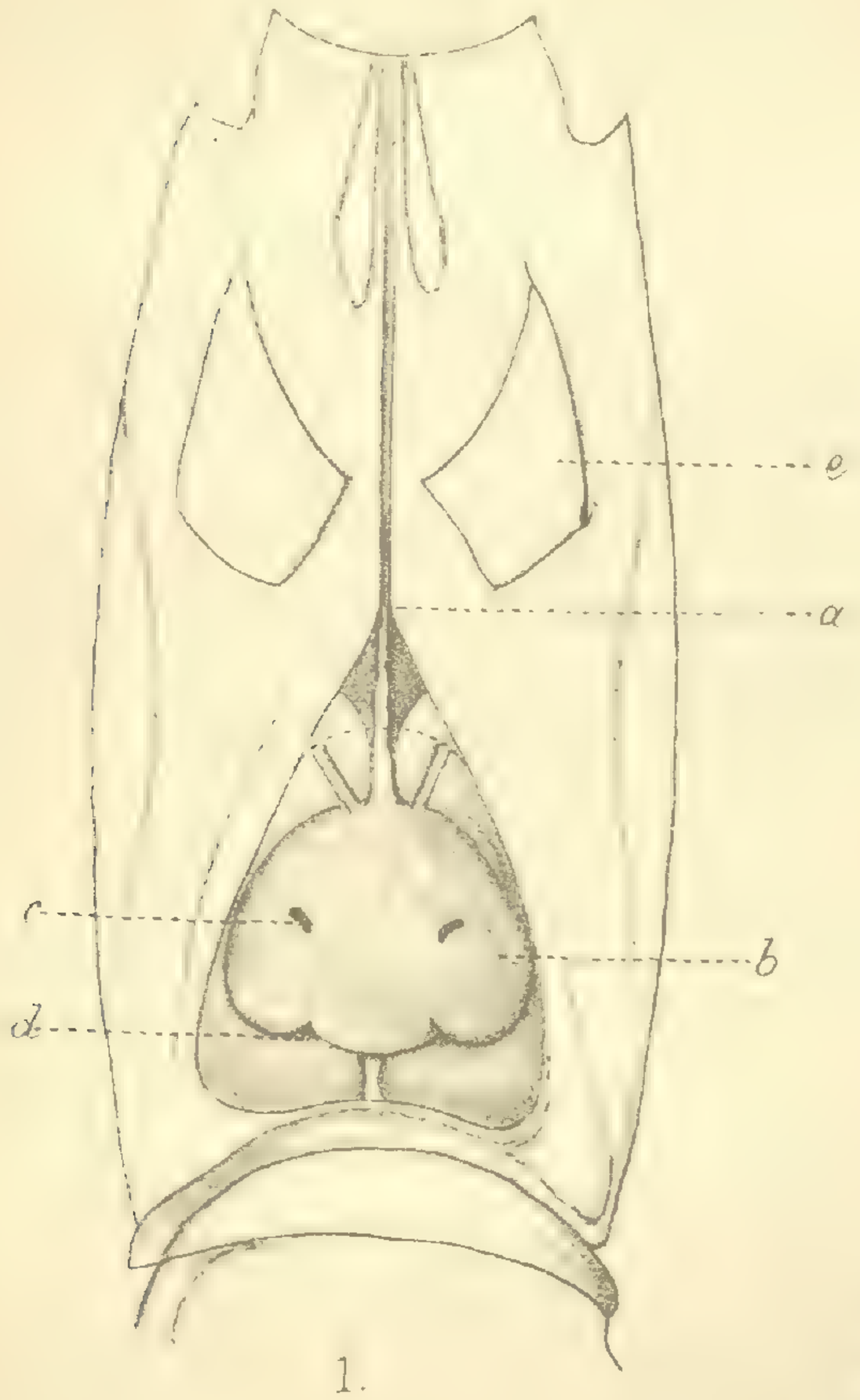
,, 8.—Liver (*b*) and stomach (*a*), × 2½.

,, 9.—Longitudinal section of the anterior portion of the liver, × 5; *a*, stomach; *b*, intestine; *c*, liver; *d*, pyloric chamber of the stomach.

,, 10.—Side view of the stomach, × 6; *a*, pyloric chamber; *b*, cardiac chamber; *c*, oesophagus.

,, 11.—View of the floor of the cardiac chamber from above, × 6; *a*, guiding ridge.

,, 12.—Same, guiding ridges separated, × 6; *a*, hastate plate; *b*, guiding ridge.



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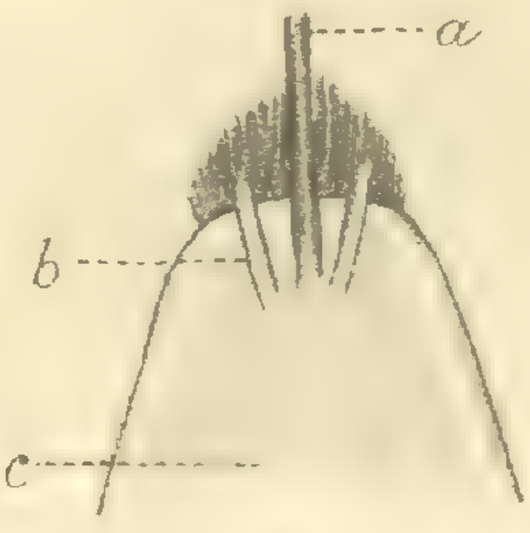

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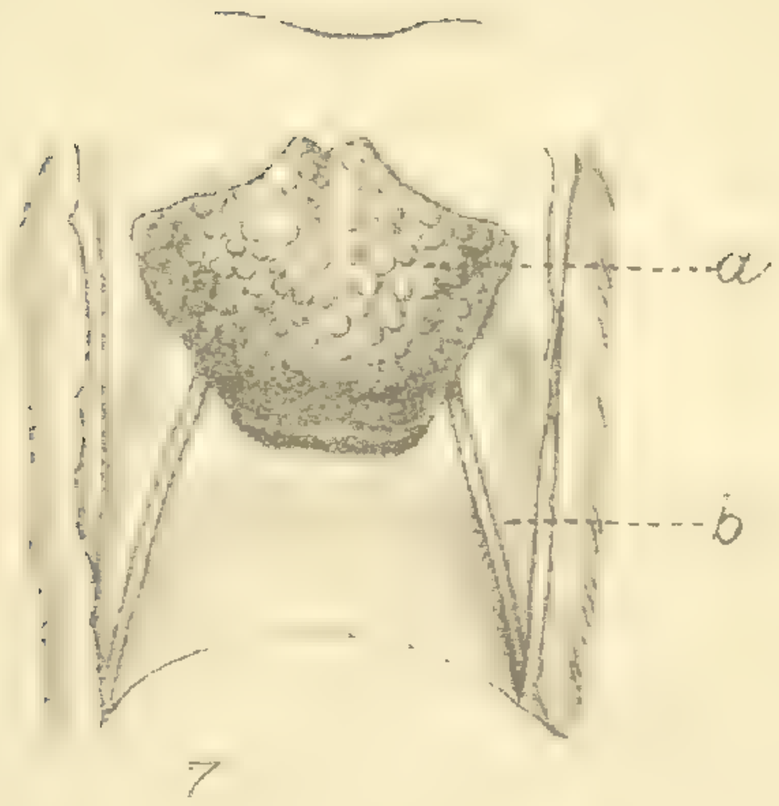

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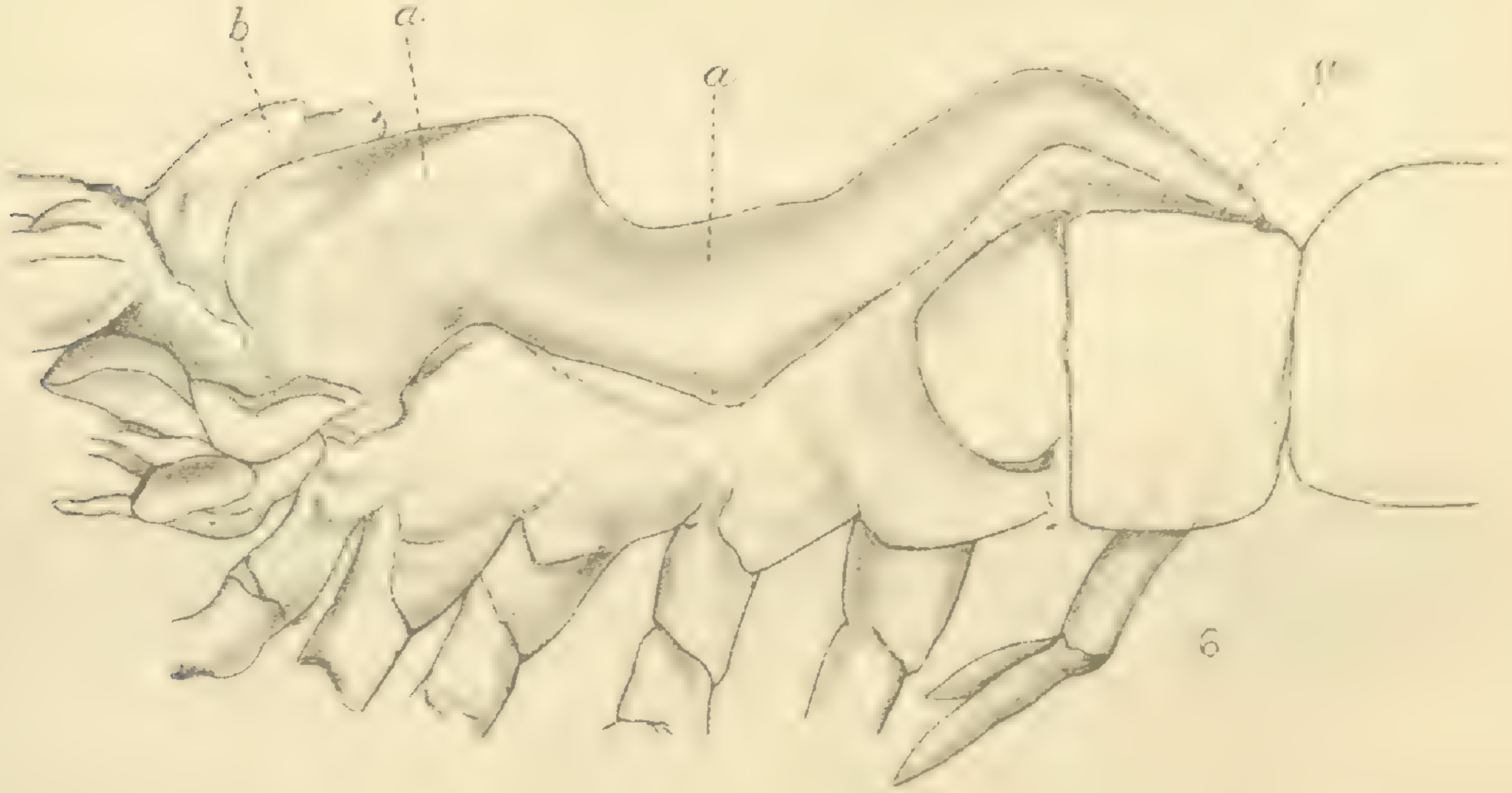

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E.N. Ghosh, del. A. Chowdhary, lith.

ANATOMY OF TYPHLOCARIS.

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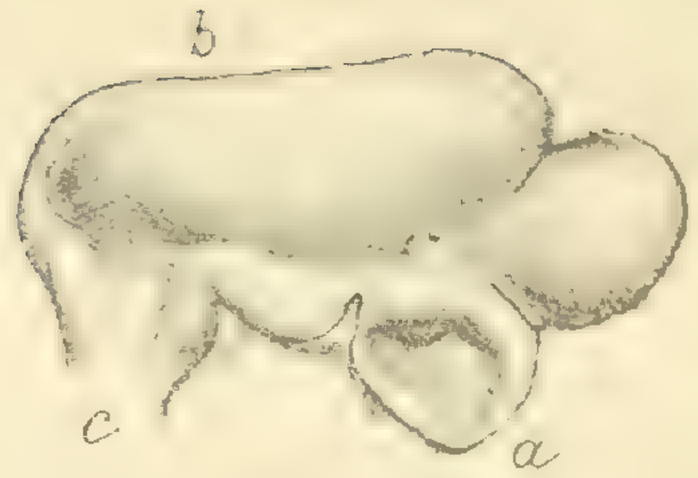

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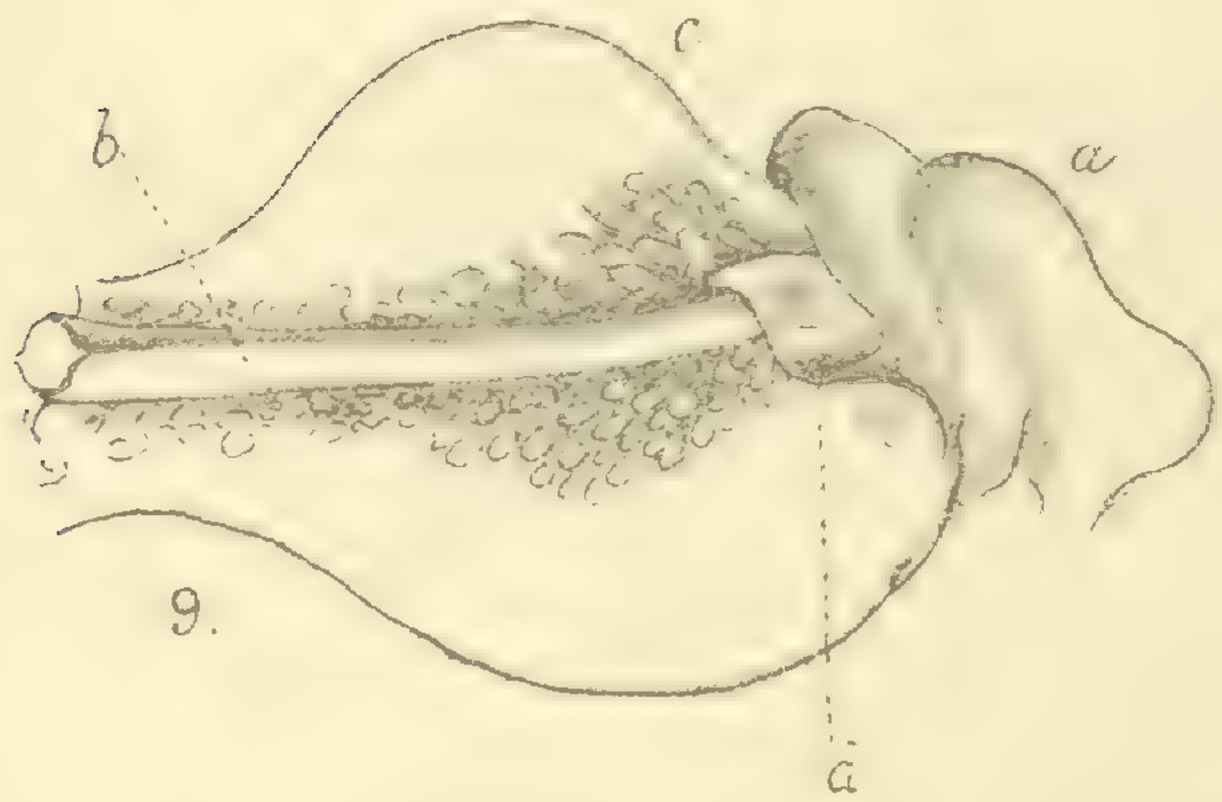

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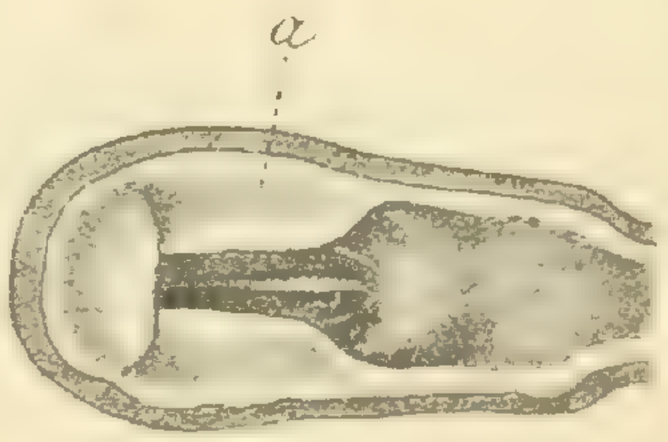

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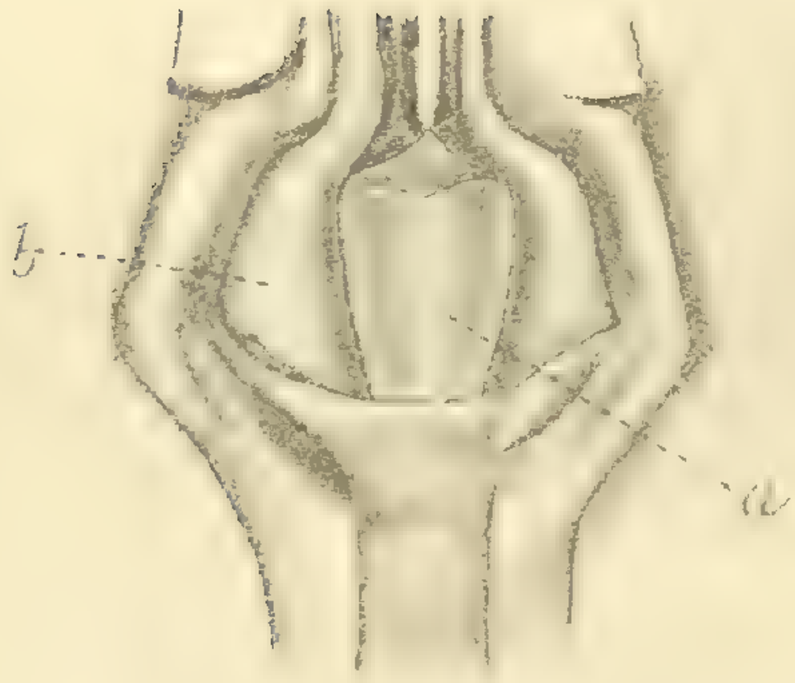

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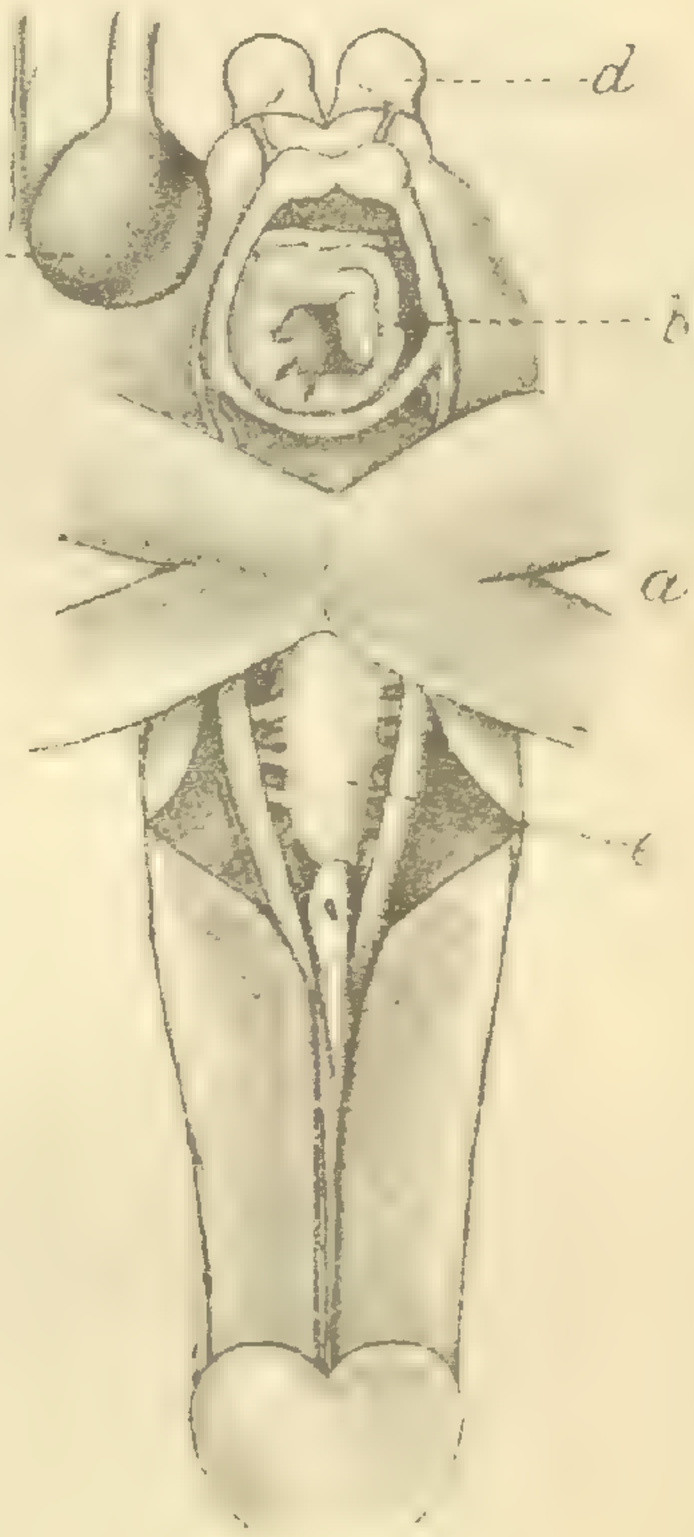

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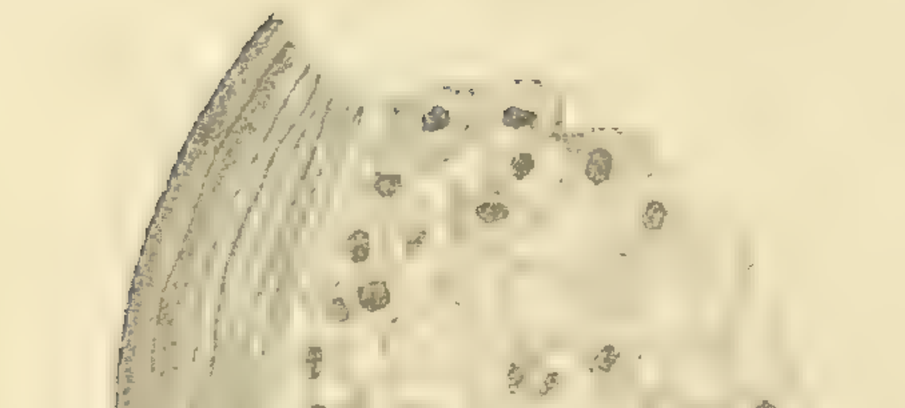

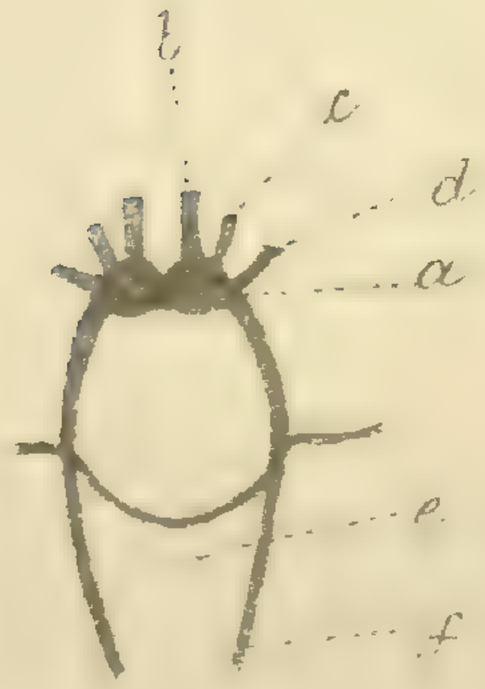

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E. N. Ghosh, del.

A. Chowdhary, lith

ANATOMY OF TYPHLOCARIS

FIG. 13.—Transverse section of the pyloric chamber, × 8; *a*, infra-pyloric plate.

,, 14.—A portion of the intestine, × 4; *a*, the posterior end.

,, 15.—Nervous system (anterior portion) × 4; *a*, endosternite; *b*, oesophagus; *c*, renal gland; *d*, ocular peduncles; *e*, thoracic ganglionic mass.

,, 16.—Anterior portion of the nervous system, × 4; *a*, cerebral ganglia; *b*, nerve to the first antenna; *c*, optic nerve; *d*, nerve to the second antenna; *e*, post-oesophageal loop; *f*, circum-oesophageal commissure.

,, 17.—Section of the ocular peduncle, × 150; *a*, cuticle; *b*, optic ganglion.

33. The Crustacea Decapoda of the Lake of Tiberias.[1]

By N. Annandale, D.Sc., F.A.S.B., and Stanley Kemp, B.A., F.A.S.B.

(Plates XII—XIV.)

Only three species of Crustacea Decapoda have been found in the Lake of Tiberias and its immediate vicinity, and it is most improbable that any addition will be made to this number.

Two of the three species, namely *Atyaephyra desmaresti* and *Potamon potamios*, have already been discussed by Barrois [2] in his "Liste des Décapodes fluviatiles recueillis en Syrie," while the third (*Typhlocaris galilea*), by far the most interesting of the three, was described by Dr. Calman as recently as 1909.

Atyaephyra desmaresti has a wide circum-Mediterranean distribution and also occurs in some adjacent countries not actually on this sea-board; the range of *Potamon potamios* is apparently restricted to the Jordan Valley, lower Egypt and the Island of Cyprus, while *Typhlocaris galilea* is endemic in one small pool near the shores of the lake, into which there is no evidence that it ever penetrates.

The last species is of peculiar interest both from a taxonomic and from a biological point of view, for not only is it isolated by its structural characters from all other freshwater or marine decapods, but it is apparently modified for a subterranean existence. The fact that the animal is found living in an open and well-lighted pool is, therefore, very strange. We may hazard the suggestion that the seismic movements which have undoubtedly occurred, and are still liable to occur, on the shores of the Lake of Tiberias may have brought about some change in its mode of life, and that it has been forced thereby to abandon the environment by which its special modifications were originally induced.

The light cast by the Decapoda on the origin of the fauna of the Lake of Tiberias is not a strong one. The only prawn actually found in the lake is essentially a "Mediterra-

[1] Published by permission of the Trustees of the Indian Museum.
[2] Barrois, Rév. biol. Nord France, V, p. 125 (1892).

nean'' species, whereas the crab has a more restricted distribution and would seem to indicate an Egyptian, though not an Ethiopian, affinity. It is noteworthy, however, that, for some reason very difficult to explain, it seems to be a general rule that the distribution of freshwater crabs is more restricted than that of freshwater prawns; *Typhlocaris* is of course an exception to this rule. as it also is to others.

Family **ATYIDAE.**

Atyaephyra desmaresti (Millet).

1832. *Hippolyte desmarestii*, Millet, Ann. Sci. nat., XXV, p. 461, pl. x B.

1837. *Hippolyte desmarestii*, H. Milne-Edwards, Hist. nat. Crust., II, p. 376.

1843. *Caridina desmaresti*, Joly, Ann. Sci. nat., Zool., (2), XIX, p. 34. pls. iii, iv.

1849. *Caridina longirostris*, Lucas, Hist. nat. Anim. Explor. Sci. Algérie, Zool., I, p. 40, pl. iv, fig. 1.

1863. *Caridina desmarestii*, Heller, Crust. siidlich. Europ., p. 238, pl. viii, fig. 3.

1866. *Atyaephyra rosiana*, Brito-Capello, Desc. esp. nov. Crust. Arachn , Lisboa, p. 6, pl. 1, fig. 1.

1868. *Caridina desmaresti*, v. Martens, Arch. f. Naturgesch., XXXIV, p. 50.

1879. *Atyaephyra rosiana*. Kingsley, Proc. Acad. Sci. Philadelphia, XXXI, p. 415.

1880. *Caridina desmaresti*, Boas, Stiid. over Decap. Slaegtsk., p. 60, pl. i, fig. 26; pl. ii, fig. 47; iii, figs. 82, 106; pl. v, figs. 151, 163.

1880. *Caridina desmarestii*, Stossich, Boll. Soc. Adriat. Sci. nat., Trieste, p. 211.

1886. *Caridina desmarestii*, Pelseneer, Bull. Mus. Belg., IV, p. 211.

1890. *Hemicaridina desmarestii*, Ortmann, Zool. Jahrb., Syst., V, p. 464.

1891. *Hemicaridina desmarestii*, Thallwitz, Abhandl. Ber. Zool. Mus. Dresden, No. 3, p. 27.

1892. *Hemicaridina desmarestii*, Barrois, Rév. biol. Nord France, V, p. 126, figs. 1-3.

1895. *Atyaephyra desmarestii*, Ortmann, Proc. Acad. Sci. Philadelphia for 1894, p. 401.

1896. *Atyaephyra desmaresti*, Picquenard, Bull. Soc. Sci. et Medic. de l'Ouest, Rennes, p. 45.

1903. *Atyaephyra desmaresti*, Bouvier, Bull. Soc. Ent. France, p. 245.

1905. *Atyaephyra desmaresti*, Bouvier, Bull. Sci. France et Belg., XXXIX, p. 67.

1905. *Atyaephyra desmarestii*, Brözek, Sitz-ber. Böhm. Ges. Wiss., Prag, No. i, p. 1.

1905. *Atyaephyra desmarestii*, Chaignon, Bull. Soc. Autun, XVII, p. 80.

This little prawn is represented in the collection before us by numerous specimens, which do not, so far as one is able to judge from published descriptions, differ in any constant character from European examples. Most of our specimens are small, the largest being a non-ovigerous female 24·5 mm. in length; the largest ovigerous female is only 19 mm. long and some are considerably smaller. The formula of the rostral teeth varies considerably, the extremes being represented by the following figures $\frac{17\text{-}26}{3\ 7}$. To some extent, however, variation in this respect is due to size and therefore, probably, to age, for very small individuals always have a small number of teeth both above and below Of the dorsal teeth, from 1 to 4 are situated on the carapace behind the orbital notch; as a rule, only 2 or 3 occur in this position, the number being rather lower than that usually found.

The size of the eggs is another variable character. In one female eyed eggs were 627 μ long by 443 μ in greatest transverse diameter; in another in which they were in a somewhat more advanced stage of development, the corresponding measurements were 593 μ and 394 μ; in all cases they had a very regular oval contour.

Living individuals were sometimes hyaline and practically colourless, having only a few scattered pigment-cells on the body and appendages; others were so deeply pigmented as to be almost black, while yet others had their pigment distributed in regular transverse stripes of a blackish colour on the thorax. abdomen and limbs. A few were noticed in which the muscles of the body had a distinct yellow tinge and were much less transparent than usual. Although no very small individuals were seen which were deeply pigmented, some ovigerous females were found to be practically colourless, except that the eggs had a deep green colour. The one male examined was hyaline.

Among the numerous individuals taken in October, 1912, in the neighbourhood of the Lake of Tiberias, we have found only this one male. From a careful examination of its appendages and of those of several females, we are able to confirm Barrois's statement as to the sexual differences that exist in the third and fourth legs of this species. His figures agree well with our own observations.

Egg-bearing females were not common in October and it is rendered probable that the breeding season was then practically over by the fact that most of the eggs observed were in an

advanced state of development and that most of the females had apparently hatched their brood.

The larva of *Atyaephyra* was described by Joly in 1843 (*loc. cit.*) and we have little to add to his observations, which are fully illustrated by good figures. Indeed, larvae from the neighbourhood of Tiberias agree with these in every respect, except that their tails are more distinctly bilobed and that their rostra are more delicate and less prominent. He gives an excellent description of the appendages, which closely resemble those of the larvae of *Caridina wyckii* (=*nilotica*) as described by Von Daday [1] and of *Xiphocaridina compressa* as described by Ishikawa.[2] The Tanganyika Atyid larvae described by G. O. Sars [3] and attributed by him with a query to the genera *Limnocaridina* and *Atyella* are apparently hatched at a somewhat earlier stage.

Atyaephyra desmaresti occurs all round the Mediterranean, in N. Africa as well as in Europe. It has been recorded from Portugal and appears to be widely distributed in France, but is not included by Keilhack [4] among the German freshwater Malacostraca.

In the Lake of Tiberias it is scarce. Barrois [5], however, obtained a few specimens from a depth of 5 to 8 metres at the south end, probably in the channel of the River Jordan in which there are submerged beds of *Vallisneria*. In the immediate vicinity of the lake it is, as Barrois states, extremely abundant in the Jordan among beds of waterweeds, both to the north and to the south. It was also found in large numbers in pools in the limestone at Ain-et-Tineh and in the stream that runs through the Wad-es-Semakh In the last situation it occurred among the roots of shrubs growing on the banks, while in the others it was only noticed among waterweeds, especially, but not exclusively, *Ranunculus aquatilis*.

Joly states that the chief food of *Atyaephyra* consists of Entomostraca and filamentous algae and that it frequently devours the putrefying dead of its own species. Except as regards the Entomostraca, we have observed similar habits in *Caridina nilotica*, which, however, also feeds largely on unicellular algae obtained by brushing up debris with the peculiar setae on the chelae of the first and second peraeopods. Apparently one or other of the mouth-parts has the power of rejecting unsuitable substances that come in contact with them.

[1] Von Daday, Zool. Jahrb. Anat., XXIV, p. 239 (1907).

[2] Chiyomatsu Ishikawa, Quart. Journ. Micr. Sci., XXV, p. 391 1885).

[3] Sars, Proc. Zool. Soc., London, I, p. 426, pls. lvii, lviii (1912).

[4] Keilhack, in Brauer's Susswasserfauna Deutschlands, XI, Malacostraca, etc. (1909).

[5] Rév. biol Nord France, VI, pp. 280, 281 (1894).

Family PALAEMONIDAE.

Subfamily TYPHLOCARIDINAE.

Typhlocaris galilea, Calman.

(Plates XII, XIII.)

1909. *Typhlocaris galilea*, Calman, Trans. Linn. Soc., Zool (2), XI, p. 93, pl. xix.

In describing *Typhlocaris*, Dr. Calman has suggested that this peculiar genus should perhaps be regarded as the type of a distinct subfamily of the Palaemonidae, and with this view we are in entire agreement. The differential characters of the Typhlocaridinae may be briefly stated as follows:—

1. The small and feebly developed rostrum.
2. The palpless mandible.
3. The rudimentary condition of the additional ramus of the outer antennular flagellum.
4. The undivided distal endite of the maxilla.
5. The presence of a pair of longitudinal suture lines on the carapace, recalling those found in certain Reptantia and Penaeidae.

In the first of these characters the subfamily agrees with some Pontoniinae and Palaemoninae; in the second with all members of that subfamily and with some Palaemoninae: in the third with the Palaemoninae more than any other subfamily. In the fourth and fifth characters *Typhlocaris* differs, so far as is known, from all other Palaemonidae.

As Dr. Calman has pointed out, *Typhlocaris* bears in certain respects, notably in the reduced rostrum, the broad telson and uropods and apparently in its general facies, a close resemblance to the peculiar S. American Palaemoninae of the genus *Euryrhynchus*. It is unfortunate that the first maxilla in that genus has not been described, but there is certainly no trace on the thorax of the "linea thalassinica." Moreover, there are other important distinctions between the two genera, especially in the structure of the outer antennular flagellum, and we are inclined to regard the resemblance between them as convergent rather than of genetic origin.

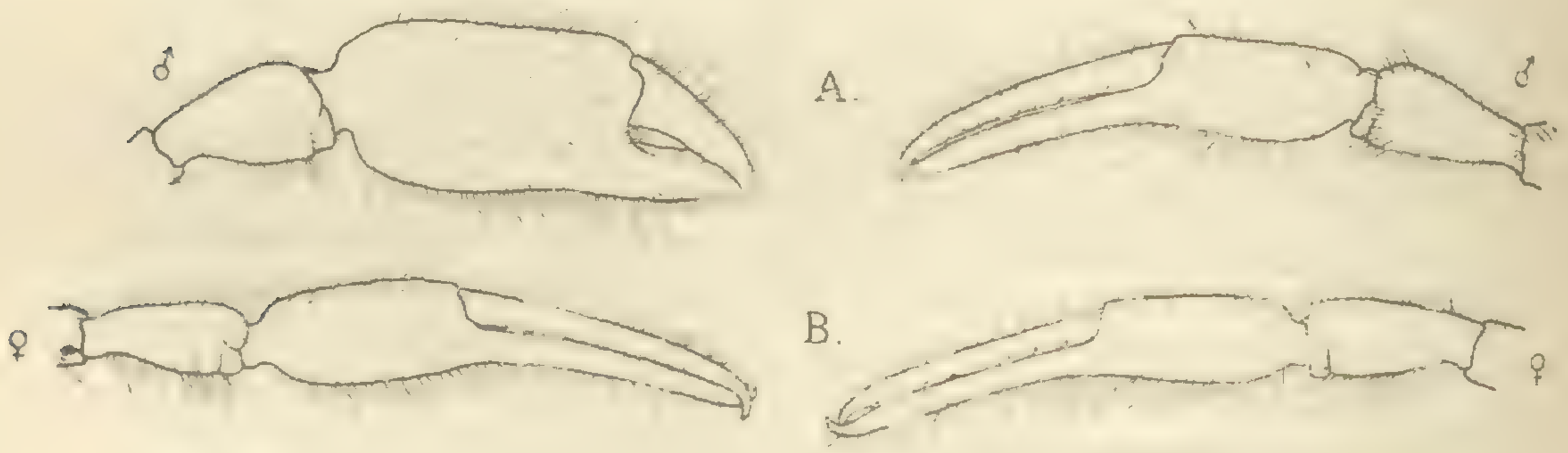
It is difficult to say in all cases what are the functions of the common characteristics, but it is noteworthy that those genera of Pontoniinae (*Pontonia*, *Conchodytes* and *Typton*), in which the rostrum is reduced, are, at any rate in most cases, of semi-parasitic or symbiotic habits and live in enclosed spaces. Nothing is known of the mode of life of the two species of *Euryrhynchus* yet described, except that they have been found in wells, into which it is probable that they have made their way from some subterranean reservoir. *Typhlocaris galilea*, as

is shown below, moves about freely in an open but well-like pool fed by a subterranean spring and not in direct communication with any large mass of water above ground. It is probable therefore that *Euryrhynchus* resembles it in bionomics.

Dr. Calman's excellent account of the species leaves little to be said as regards its external characters, while Mr. Ekendranath Ghosh has, in the preceding paper of this series, described its internal anatomy in detail.

The specimens before us indicate that the second peraeopod of the male mentioned by Calman, in which the immovable finger is shorter than the dactylus, is, as he suggests, abnormal; but our specimens also show that there is normally a very marked dissimilarity between the two large chelae of the male (fig. A).

In the female the two are similar in form. though not always equal (fig. B) and agree with Calman's fig. 11, except that they are a little more slender and longer. In the leg of this



type the carpus is only a little shorter than the palm; the palm itself is almost cylindrical and the fingers, which are similar in outline, are slender and of about one and a half times its length.

In the male (fig. A) one chela is normally of this type, though slightly stouter and not so long; while the other is strikingly different. The carpus is a little more swollen distally and not much more than half as long as the palm. The palm is distinctly flattened and its breadth is to its thickness as $10\frac{1}{2}$ to 7. The fingers are very much shorter and stouter than in the other claw. The dactylus is only about two-thirds the length of the palm; it has no cutting edge, but is feebly grooved internally, both margins being definitely sinuous in lateral view; there is no process sufficiently distinct to be called a tooth. The immobile finger is a little shorter than the dactylus and resembles it in form except that the internal groove is obsolete. The limbs of both types are set with coarse setae.

Dr. Calman has kindly sent us a sketch of the claws of a male specimen recently seen by him in which the same

secondary sexual character is apparent. We have ourselves examined four males and three females.

The colour in life is of a uniform dead white, neither opaque nor transparent but rather translucent, resembling that of paraffin wax or, more accurately, that of the opalescent glass of which lamp-shades are often made. There is no trace of external pigmentation; the partial opacity is inherent in the muscles, the integument being perfectly transparent. The stomach and the liver can be detected externally as dark irregular masses.

The minute hairs on the thorax are more conspicuous in the living animal than they are in specimens in spirit, as they stand upright and are as a rule covered with minute debris (pl. XII, fig. 1). They do not, however, collect sufficient dead matter to aid in concealing the animal, which is a most conspicuous object in its natural surroundings.

So far as it is possible to ascertain from the most careful enquiries on the spot, *Typhlocaris* is only found in the octagonal pool at et-Tabghah called Birket 'Ali-ed-Dhaher, in which it has long been known to the Bedouins of the district as العقرب لا بيضى or "white scorpion." The pool (pl. XIII) has recently been described in this Journal and the water analysed[1]; all that we need say here is that it is a small artificial pool containing from six to ten feet of brackish and sulphurous water and about 58 metres in circumference; that it now has no direct communication with the Lake of Tiberias, close to the shore of which it is situated, but that a connection of a sort, perhaps artificial, existed in historic times. It must be fed by a subterranean spring or springs, but the point of entry of these has not been investigated. In October, 1913, the surface was almost entirely concealed by the growth of a gigantic grass, which was rooted at the edge, but sent out long floating stems. No other phanerogamic water-plants occurred and the fauna, probably owing to the composition of the water, was much poorer than that of fresher pools in the neighbourhood. Only one species of fish (*Discognathus lamta rufus*, Heckel) and two of Mollusca[2] (*Bithinella* spp. nov.) were seen and no examples of *Atyaephyra* could be discovered, notwithstanding a very careful examination of the floating grass.

In its movements *Typhlocaris* closely resembles *Palaemon*, but is rather more sluggish than any Indian species of that genus with which we are acquainted. As a rule it progresses on the bottom, partly by means of its walking legs and partly by the use of its swimmerets, the abdomen being raised higher than the thorax in order to give the latter free play. The first peraeopods are used to a slight extent in locomotion, but their

[1] Christie, Journ. As. Soc. Bengal, 1913, p. 25.
[2] For this determination we are indebted to Mr. H. B. Preston.

chief functions are to clean the other appendages, including the swimmerets, and to convey food to the mouth. Occasionally the animal moves forwards through the water by means of the swimmerets alone, the fore parts then being raised higher than the abdomen. It was not, however, observed to approach the surface. *Typhlocaris* can also dart rapidly backwards when alarmed, but does not do so rapidly or with such force as many species of *Palaemon*. The manœuvre is executed in the usual manner, that is to say by suddenly bending the telson towards the base of the thorax.

So long as the prawn is moving either backwards or forwards, the claws are held with the basal segments projecting out from the body almost at right angles, but with the carpus and chela directed forwards. They have the appearance of protecting the anterior part of the body and to some extent feeling the way. The chief part in testing the surface in forward progression is, however, played by the outer maxillipeds (pl. XII, fig. 2), with which *Typhlocaris* constantly taps the ground, as does *Palaemon*. The antenna is, as a rule, held directed outwards and often considerably upwards, while the rami of the antennules are spread out so as to cover as large an area as possible. At periods, when the animal is at rest, they are held still, but, as a rule, they are in frequent motion. It was observed that a movement in the water near the prawn sometimes, but not always, caused it to dart away.

Typhlocaris is evidently timid in disposition and, unless engaged in feeding, moves away when it is approached by a crab or fish, although no direct evidence is forthcoming that either *Potamon* or *Discognathus* attacks it. Several of the specimens obtained, however, have lost and were regenerating various limbs.

It was found possible to attract the prawns in considerable number from their hiding places by throwing into the pool chicken and pigeon bones. The bones were seized by the chelae, pieces of meat were torn from them and conveyed to the mouth by the first peraeopods, or they were carried away bodily under stones, notwithstanding the efforts of large numbers of *Discognathus* which were also nibbling at them. Little notice was taken of half a dead *Discognathus* let down on a string beside a prawn; but the prawn seized the string with its chelae and gave it a violent tug. While moving on the bottom of the pool, which is composed of fine mud, and on the stones of which the walls are built, *Typhlocaris* was often observed to pick up small objects by means of its first peraeopods and devour them; but their nature was not detected.

No observations were made which cast any light on the functions of the sutures in the carapace; but we may note that the carapace fits tightly round the bases of the legs and thus probably assists in respiration by keeping mud from entering

the gill-chamber. As Dr. Calman has pointed out, the margins of the carapace are membranous; this feature, combined with the horizontal hinge, may well be useful in the direction indicated.

No direct evidence could be obtained that *Typhlocaris* is subterranean in habits: it is certainly not exclusively nocturnal. As nothing is known of the structure of the pool in which the animal lives, it is impossible to say whether it can retire underground; it may do so periodically to breed or for other purposes, and one of the monks who live at et-Tabghah on one occasion searched for specimens for some months without being able to obtain them. No details, however, are available as to the methods he adopted. No specimens were seen by Annandale on a visit paid to the pool early in the morning, although several were observed and captured later on in the same day.

In most cases the prawns were first seen emerging, at all hours between 10 A. M. and dusk, from under stones lying on the bottom or forming part of the walls. They frequently wandered under other stones and sometimes emerged again at a considerable distance from the place at which they entered. Several were observed actually at noon, but none were seen in bright sunlight, which never, at any rate in October, reached the part of the pool in which they lived. The removal of the floating grass from the surface apparently made no difference in their movements and they showed no inclination to avoid the fairly strong light that reached and shone through the clear water practically without obstruction. An individual living in an aquarium did not even move away when a lamp was placed close to the glass against which it rested, although the lamp was left in the same position for half an hour.

Typhlocaris, therefore, is evidently not negatively heliotropic, although no evidence could be obtained that it is, either under natural conditions or in captivity, positively so.

None of the specimens obtained were actually breeding at the time they were killed, but the condition of their gonads would suggest that the breeding season was approaching.

The photographs reproduced on plate XII were taken at Tiberias by the Rev. J. Cohen of that town under the supervision of one of us. We have to thank him for his courteous assistance in the matter.

Family POTAMONIDAE.

Potamon (Potamon) potamios (Olivier), Rathbun.

(Plate XIV, fig. 1).

?1804. *Cancer potamios*, Olivier (*partim*), Voy. Empir. Oth., IV, p. 240, atlas, pt. 2, pl. xxx, fig. 2.

1893. *Telphusa fluviatilis*, Barrois, Rév. biol. Nord France, V, p. 125.
1904. *Potamon potamios*, Rathbun, Mem. Mus. Hist. Nat. (Paris), (4), VI, p. 257.

We follow Miss Rathbun in calling the common crab of the Jordan Valley *Potamon potamios*, but in so doing are of the opinion that it is doubtful whether this form was included in the composite group to which Olivier in 1804 gave the name of *Cancer potamios*. The species, or group, was founded to include crabs from Naxos, Syria, Mesopotamia and Persia, an area from which at least two allied forms are known and in which the crab accepted by Miss Rathbun as *Potamon potamios* probably does not occur. The term 'Syria' is often used somewhat loosely; but Olivier himself in his atlas (*loc. cit.*, pl. xxii) distinguished Syria from Palestine, and his journey hardly extended into the latter country. We have no reason to think that the species, as defined by Miss Rathbun, has been found within the limits of Syria proper, for Djerach, the only 'Syrian' locality from which *P. potamios* is definitely recorded, lies near the R. Jabbok in Eastern Palestine considerably south of the Lake of Tiberias. Both Miss Rathbun (*loc. cit.*) and Col. Alcock[1] have, however, accepted the Palestine crab as the type of its genus, and any proposal to alter the name would now only lead to confusion and would, in any case, be based merely on a study of probabilities.

As the group to which *P. potamios* belongs has given rise to considerable confusion, apart from nomenclature, owing to the extremely close relationships of its members, we take this opportunity to discuss it in some detail, having good series of specimens of most of the forms before us.

The group, as we conceive it, consists of only two species, *Potamon potamios* (Olivier), Rathbun, and *P. fluviatile* (or *edule*) (Latreille), the latter being divided into five local races: *fluviatile* (*s. s*); *setiger*, Rathbun; *ibericum*, Marschall de Bieberstein; *gedrosianum*, Alcock, and *monticola*, Wood-Mason. The only one of these forms of which we have not seen specimens is *setiger*. The types of *gedrosianum* and *monticola* are in the Indian Museum, but we have some doubts as to the status of the latter and consider it possible that, under this name Alcock has included two distinct races. In any case the number of specimens known is so small that it would hardly be profitable for us to discuss the question. We have, therefore, omitted *monticola* from the following key, but have figured one of the types and also the only specimen from the Khasi Hills in plate XIV, figs. 6 and 5, respectively. It will be noticed in these figures that the eyes are considerably larger and stouter than in *P. potamios* or in any of the western races of *P. fluviatile*.

[1] Rec. Ind. Mus., V, p. 258 (1910).

KEY TO THE CRABS OF THE *Potamon potamios* GROUP.

I. Epigastric crests only a little in advance of post-orbitals and parallel to them; post-orbitals running in a straight line at right angles to the long axis of the carapace, hardly interrupted or angulate at anterior end of cervical groove *P. potamios.*

II. Epigastric crests usually well in advance of post-orbitals and sloping towards them; post-orbitals sinuous, convex forwards or slanting, distinctly interrupted and angulate at anterior end of cervical groove .. .. *P. fluviatile, s.l.*

Races of *P. fluviatile.*

A. Length of carapace nearly seven-eighths its breadth; propodus of last leg less than twice as long as broad .. .. .. *fluviatile.*

B. Length of carapace usually less than five-sixths its breadth; propodus of last leg usually at least twice as long as broad.

1. Carapace setose .. .. .. *setiger.*

2. Carapace not setose

a. Middle portion of cervical groove on either side obsolete, anterior part not very sharply defined; epigastric crests more in advance of post-orbital crests .. *ibericum.*

b. Cervical groove distinct throughout its length, forming a well-defined sulcus at its anterior extremity; epigastric crests less in advance of post-orbital crests .. *gedrosianum.*

So far as we are able to judge from the descriptions given by Miss Rathbun [1] and Dr. Pesta [2], we are doubtful whether *P. fluviatile setiger* is more than a phase of *P. fluviatile ibericum*: it seems to differ from that race in no character except the presence of short hairs on the carapace, a feature which is of little specific value in certain other Decapod crustaceans, *e.g. Hippolyte varians* form *fascigera*. Dr. Pesta, moreover, states that the hairs are frequently worn away and we can detect small pits, such as those from which setae might be expected to arise, on the carapace of many specimens of the races *ibericum* and *gedrosianum*. For the present, we prefer to leave the precise status of the form doubtful. We cannot, however, accept it as a distinct species.

Alcock has dealt in his comprehensive monograph of the Indian Potamonidae very fully with the differences between *gedrosianum* and *ibericum* [3], which are much more nearly related to one another than either is to the typical European race of *P. fluviatile.* We have taken measurements of the larger specimens in the collection of the Indian Museum and give them in an appendix. They may be summarised as follows:—

[1] Mem. Mus. Hist. Nat., Pars (4), VI, p. 258. text-fig. 3, pl. ix, fig. 2.
[2] Ann. k. k. naturhist. Hofmus., Vienna, XXVII, p. 27. text-fig. 12. 1913.
[3] Cat. Ind. Decap., Crust. I, fasc. 2, Potamonidae, pp. 21-23, figs. 1, 37. 1910.

	Carapace, length ÷ breadth, × 100.			Propodus of 5th leg, breadth ÷ length × 100.			
	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	No. of specimens.
Potamon potamios ..	79·4	**80·1**	82·1	44·1	**51·6**	55·0	7
,, *fluviatile fluviatile* ..	86·0	**87·0**	88·1	43·2	**46·1**	49·2	6
,, ,, *ibericum* ..	78·2	**81·7**	86·0	48·8	**53·4**	59·0	18
,, ,, *gedrosianum*	75·4	**81·9**	84·3	46·5	**53·5**	58·4	16

From this table it would seem that in their proportions, *P. fluviatile ibericum* and *gedrosianum* resemble *P. potamios* more closely than they do *P. fluviatile fluviatile*; but the importance of this fact is minimised by the differences in the form of the post-orbital and epigastric crests, a character which we consider of more weight than those derived from measurements. We follow Alcock, therefore, in regarding the two forms as races of *P. fluviatile* rather than of *P. potamios*.

Potamon potamios is the common freshwater crab of Lower Egypt and of the valleys of the Jordan and its tributaries; it has also been found in Cyprus, which lies not very far from the coast of Palestine.

Potamon fluviatile has, as a species, a wider range, extending through Italy and Greece into Turkey, the Archipelago, Asia Minor, Northern Syria, Mesopotamia, the districts round the Black Sea and the Caspian, Persia, North-West India and possibly the Eastern Himalayas and the Khasi Hills in Assam. In Northern Africa it is found in Morocco, Algiers and Tunis, penetrating inland to the Sahara.

The distribution of its local races is as follows:—

Race *fluviatile*,

Italy, Greece, Morocco, Algiers, Tunis, the Sahara.

Race *ibericum*,

The Crimea, the Caspian Sea, Asia Minor, Northern Syria, Persia, Afghanistan and the Jhelum Valley in N. W. India.

Race *setiger*,

Northern Syria, Mesopotamia.

Race *gedrosianum*,

Seistan, Baluchistan, Peshawar and the Punjab Salt Range.

Race (?) *monticola*,

Eastern Himalayas and (?) the Khasi Hills, Assam.

Potamon potamios is extremely common round the edge of the Lake of Tiberias and the neighbouring springs, inhabiting burrows just above the water-line and thence wandering both into the water and on to dry land in search of food. As soon as the first rains of the winter season fall (in 1912 this was on October 16th), its landward expeditions are greatly extended. Near Tiberias, after rain had fallen, it was noticed in considerable numbers on the road round the lake, and several large individuals were seen that had been crushed by the feet of passing animals. The food is evidently of a very varied nature. Large individuals were observed eating dead fish in the lake; others were attracted to (and captured by) a piece of tomato attached to a string; a chicken-bone thrown into the spring at Ain-et-Tineh was seized and carried away bodily by a crab that appeared to issue from under a rock before the bone had touched the water; half-grown individuals were watched running after, seizing in their claws and devouring, large black ants [1] in the highway.

At least three years must elapse before the full size is reached. The smallest specimen obtained in October measures 9·5 mm. in breadth and none appreciably smaller were seen. One probably something over one year old measures about 14 mm. across the carapace, while the great majority of specimens measure from 30 to 40 mm. Large individuals are comparatively scarce; the largest in the collection of the Indian Museum measures 61 mm. in breadth, but some that were seen in the lake were probably larger. The breeding season is apparently in winter. In October a pair were seen evidently just about to couple, but separated on being touched. The female lay on her back in the water and the male clasped her with his walking legs.

The dorsal surface of small and half-grown individuals examined in a living condition in Galilee was of a dull and almost uniform olive green, only the tips of the claws and feet being paler. Two types of colouration were, however, observed among large males and females, and in this respect no difference between the sexes was apparent. In one type a purple, and in another an olivaceous yellow predominated. In the former

[1] The large workers of *Camponotus maculatus thoracicus*, Fabr., var. *fellah*, Emery. We have to thank Prof. W. M. Wheeler for identifying specimens.

the carapace was dull purple, fading to violet at the margin and on the limbs; the tips of the claws and legs were bright orange and the ventral surface was of a pale neutral shade tinged with violet. In the second type the dorsal surface was of a bright olivaceous yellow-brown, fading to a distinct yellow at the tips of the limbs, and the ventral surface was pale without a trace of violet. Purple individuals seemed to be more numerous at the end of October than at the beginning of the month, and both of the pair found together belonged to this type. It is possible that the purple colouration, which is confined to fully mature individuals of both sexes, is periodical, only being adopted at the approach of the breeding season.

Note on the Pool inhabited by *Typhlocaris*.

One of us has recently received the following note from the Rev. S. H. Semple of Tiberias. It is dated July 12th, 1913.

"The doubt as to the source of the abundant water-supply for the old mills at Tabighah you can lay to rest. It is no other than the octagonal fountain, which since your visit has changed ownership and been thoroughly cleared of the "grasses" you mention [J.A.S.B., IX, p. 28]. The jungle outside has likewise disappeared, and it is at once seen that the water makes its way through a break, low down, in the masonry and almost directly underneath the two circular openings [pl. xiii, fig. 3 B]. There are two "heads" to the spring, and it is now ascertained that the water is more than three metres deep where formerly the grasses grew so luxuriantly. (Compare with this the "two feet" of Thomson's "Land and Book," Vol II, p. 414)."

Although this proves that water flows from the pool into the lake, the intervention of water-mills would render migrations from one to the other on the part of *Typhlocaris* practically impossible. It is to be hoped that the cleaning of the pool has not exterminated the prawn.

APPENDIX.

Measurement of crabs of the *Potamon potamios* group.

			Carapace.			Propodus of 5th peraeopod.		
			Length.	Breadth.	Length ÷ breadth × 100.	Length.	Breadth.	Breadth ÷ length × 100.
P. potamios—								
L. of Tiberias, $\frac{8311}{10}$ ..		♂	42·1	53·0	79·4	13·25	6·6	49·8
		♀	35·3	44·2	79·9	11·6	5·75	49·6
		♀	33·2	41·75	79·5	10·1	5·55	55·0
		♂	30·7	38·2	80·0	9·65	5·3	54·9
		♂	28·4	35·3	80·5	9·25	4·95	53·5
		♀	27·0	34·0	79·4	8·7	4·7	54·0
Syria, $\frac{3402}{9}$		♂	50·4	61·4	82·1	16·55	7·3	44·1
P. fluviatile fluviatile—								
Florence, $\frac{4054}{4}$ ..		♂	46·4	53·2	87·2	14·9	6·8	45 6
		♂	45·2	52·1	86·8	14·6	6·3	43·2
		♂	43·5	50·1	86·8	13·2	6·5	49·2
		♂	42·8	48·6	88·1	13·7	6·25	45·6
		♂	42·5	49·4	86·0	13·4	6·3	47·0
		♀	39·9	46·8	85·3	—	—	—
P. fluviatile ibericum—								
Teheran, $\frac{4178}{4}$ ..		♂	42·6	51·0	83·5	12·8	6·6	51·6
		♀	38·6	48·75	79·2	12·5	6·1	48·8
		♂	31·7	39·3	80·7	9·8	5·15	52·6
		♀	31·6	38·3	82·5	9·6	5·2	54·2
Shiraz, $\frac{4025}{4}$ ..		♀	44·5	54·0	82·4	12·4	6·5	52·4
		♀	39·9	50·1	79·6	11·5	6·2	53·9
		♀	35·5	44·6	79·6	10·5	5·45	51·9

		Carapace.			Propodus of 5th peraeopod.		
		Length.	Breadth.	Length ÷ breadth × 100.	Length.	Breadth.	Breadth ÷ length × 100.
***P. fluviatile ibericum*—**							
Syria, $\frac{1616\text{–}8}{10}$ ..	♀	36·75	43·3	84·9	10·5	5 7	54·3
	♀	32·5	38 1	85 3	9·9	4·95	50·0
	♂	31·6	36·75	86·0	9·5	4·9	51·6
Afghanistan, $\frac{4028}{4}$ ..	♀	28·5	34 5	82·6	8·2	5·0	60·9
	♀	27·9	33·6	83·0	—	—	—
	♀	27·6	33·2	83·1	7·5	4·3	57·3
	♀	26·7	32·2	82·9	7·8	4·6	59·0
Afghanistan, $\frac{5463}{10}$ ..	♀	30·9	37·6	82·2	—	—	—
Jhelum, $\frac{5521}{10}$ ..	♀	34·65	42·8	81·0	10·03	5·5	54·8
	♀	25·6	32·75	78·2	7·6	4·3	56·6
Transcaspia, $\frac{7063}{9}$ ..	♀	38·7	48·0	80·6	12·25	6·3	51·4
***P. fluviatile gedrosianum*—**							
Seistan, $\frac{5015}{10}$ ..	♂	47·2	56·9	83·0	15 7	8·15	51·9
	♀	39·75	48·1	82·6	11·8	6 2	52·5
	♂	38·9	47·3	82·2	13·05	6·85	52·5
Seistan, $\frac{5554}{10}$ ..	♀	43·8	55·3	79·2	12 85	7·5	58 4
Quetta, $\frac{4655\text{–}8}{10}$ ..	♂	48·9	58·4	83·7	15·5	8 05	51·9
	♂	42·5	51·9	81·9	—	—	—
Peshin Valley, Baluchistan, $\frac{5550}{10}$ ..	♀	32·0	38·55	83·0	9·25	5·25	56·8
	♂*	52·8	64·25	82·2	15·7	8·1	51·6
	♀*	45·5	54·7	83·2	13·15	7·1	54·0
	♀	37·35	44·6	83·7	9·2	5·0	54·3
	♀	34·4	40·8	84·3	10·25	5·75	56·1

* Types of the race.

		Carapace.			Propodus of 5th peraeopod.		
		Length.	Breadth.	Length ÷ breadth × 100.	Length.	Breadth.	Breadth ÷ length × 100.
P. fluviatile gedrosianum—							
Peshin Valley, Baluchistan, $\frac{5550}{10}$ ..	♂	31·6	37·75	83·7	9·3	5·25	56·5
	♂	29·15	35·1	83·0	8·8	5·0	56·7
Salt Range, Punjab, $\frac{6416}{3}$	♀	35·0	46·2	75·8	8·3	4·3	51·8
Peshawur, $\frac{5527}{10}$ ..	♂	38·4	48·3	82·9	11·7	5·9	50·4
Hallur Hahar, $\frac{6996}{3}$ ..	♂	25·85	34·3	75·4	9·25	4·3	46·5
P. fluviatile monticola—							
Darjiling, $\frac{3032}{4}$ ..	♂*	18·65	24·05	77 5	6·85	3·35	48·9
	♀*	17·0	20·9	81·3	5·5	2 8	50·9
	♀*	16·85	21·4	78·7	6·3	2·9	44·4
Khasi Hills, $\frac{4017}{4}$ ..	♂	20·6	27·35	75·3	—	—	—

* Types of the race.

EXPLANATION OF PLATES.

Plate XII.

Adult female of *Typhlocaris galilea* (Regd. no. $\frac{8311}{10}$) photographed from life. Slightly enlarged.

Plate XIII.

The pool, Birket 'Ali-ed-Dhaher, in which *Typhlocaris galilea* is found.

Fig. 1.—The surface of the pool overgrown with grass.

,, 2.—The same, from a slightly different point of view, after being cleared.

,, 3.—The ancient outlet of the pool and the steps leading down to the platform that juts out into the water.

A = the highest water-level of the pool at present:
B = the ancient outflow.

Plate XIV.

The carapaces of *Potamon* (*Potamon*) *potamios* and its allies.

Fig. 1.—*Potamon potamios* (Olivier), Rathbun, from Tiberias, Palestine (Regd. no. $\frac{8311}{10}$). Nat. size.

,, 2.—*Potamon fluviatile fluviatile* (Latreille) from Florence, Italy (Regd. no. $\frac{4054}{4}$). Nat. size.

,, 3.—*Potamon fluviatile ibericum* (Marsch. Bieb.) from near Shiraz, Persia (Regd. no. $\frac{1025}{1}$). Slightly reduced.

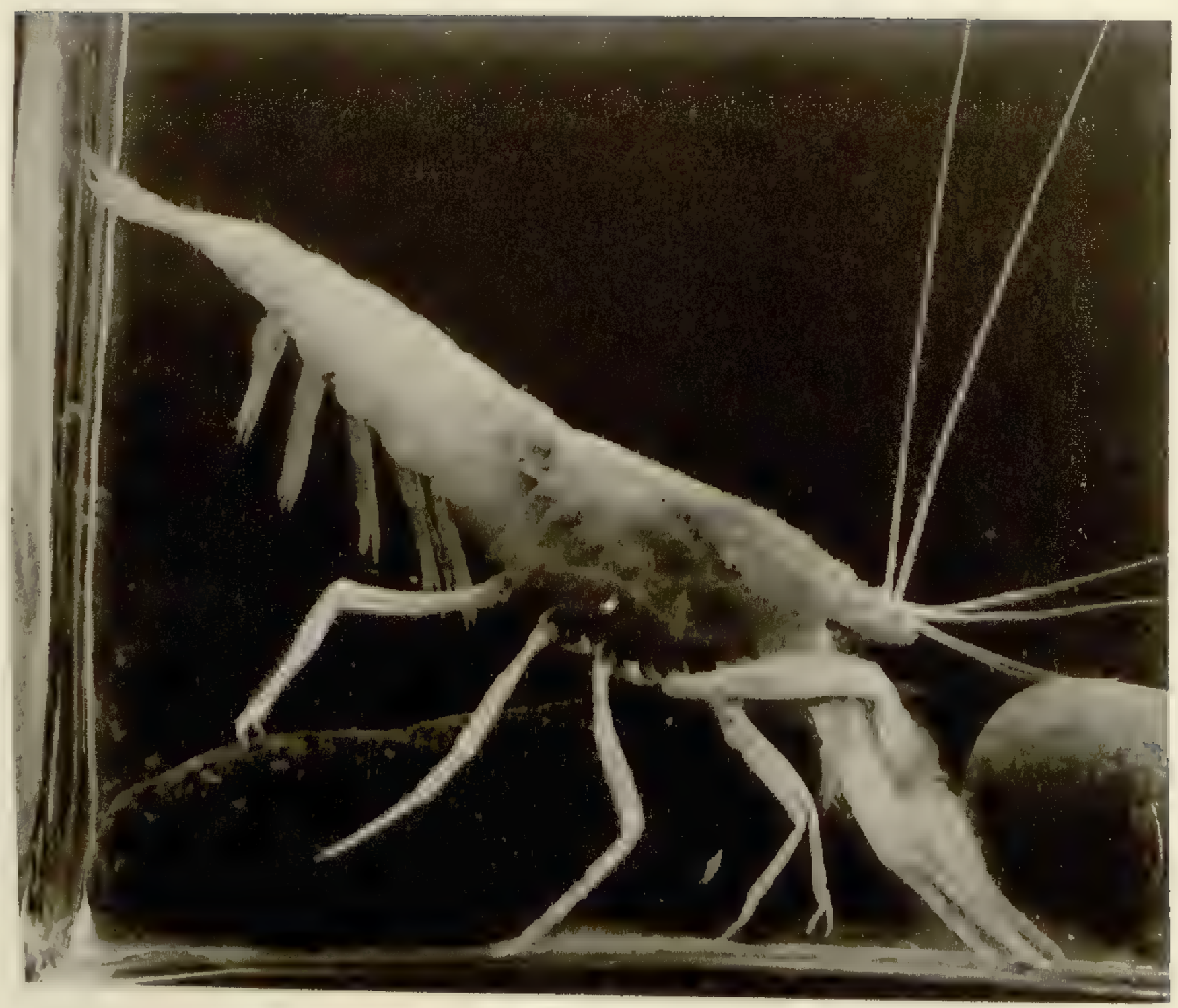
,, 4.—*Potamon fluviatile gedrosianum*, Alcock, from the Peshin Valley, Baluchistan (♂ type, Regd. no. $\frac{5550}{10}$). Slightly reduced.

,, 5.—*Potamon fluviatile monticola* (Wood-Mason) from the Khasi Hills, Assam (Regd. no. $\frac{1017}{1}$). Enlarged.

,, 6.—*Potamon fluviatile monticola* (Wood-Mason) from Darjiling (♂ type, regd. no. $\frac{1032}{1}$). Enlarged.

Note.—All the specimens figured are adult or apparently adult males.

1.

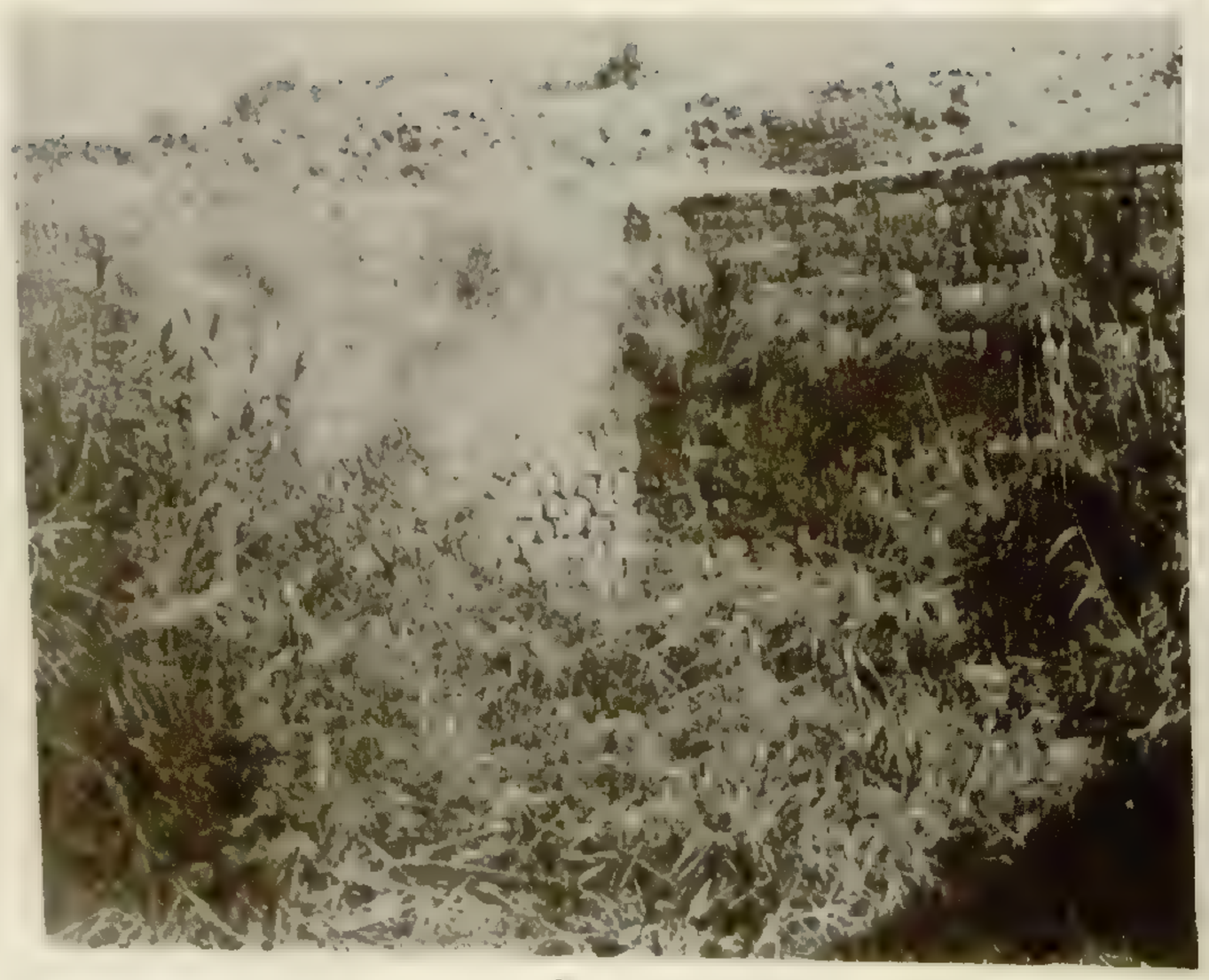


2.

Rev. J. Cohen, Photo

THE BLIND PRAWN OF GALILEE—(TYPHLOCARIS GALILEA, CALMAN).

Bemrose, Collo, Derby.



1.

3.

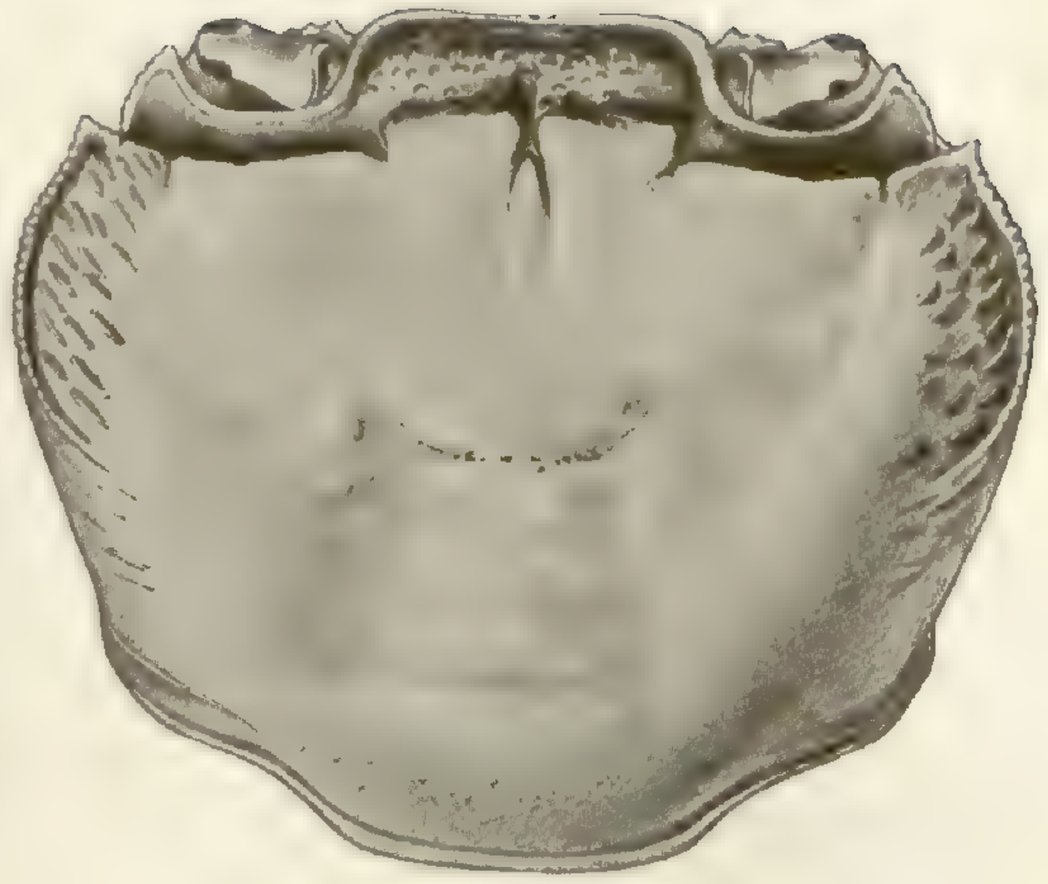
2.

N. A. Photo

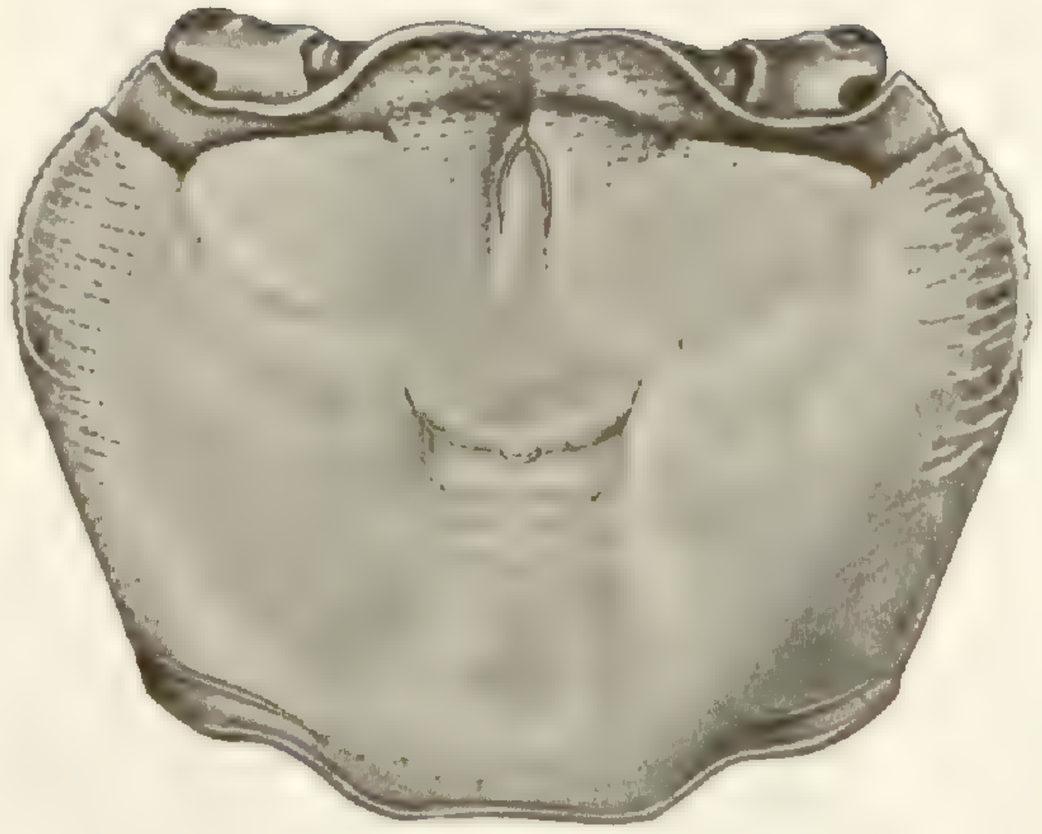
BIRKET 'ALI-ED-DHAHER, THE HABITAT OF TYPHLOCARIS GALILEA, CALMAN.

Bemrose, Collo., Derby.

1.



3.



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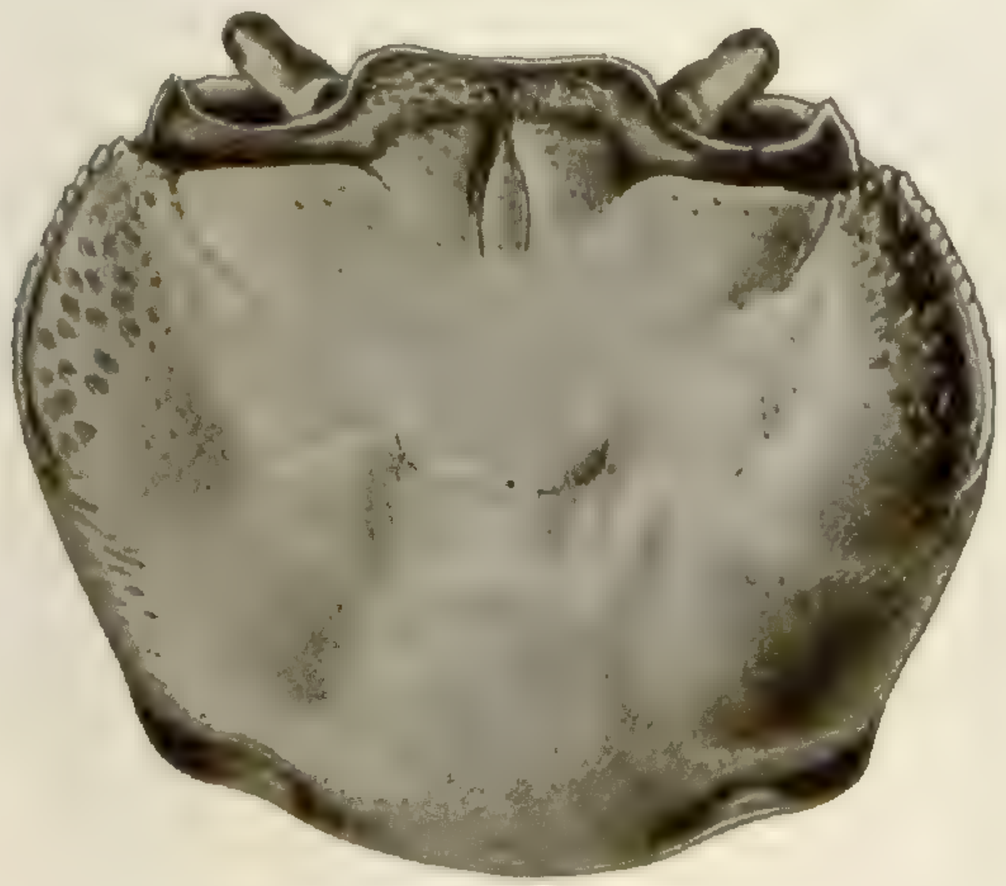

2.

4.

6.

A C Chowdhary, del.

Bemrose, Collo., Derby.

CRABS OF THE POTAMON POTAMIOS GROUP.

Plate XIV.

34. The Plays of Bhāsa, and King Darśaka of Magadha.

By Kāshi-Prasād Jāyaswāl, B.A. (Oxon).

Dr. Geiger in the Introduction to his translation of the Mahāvaṃśa[1] (p. xlv) rejects Darśaka of the Puraṇic list as "certainly an error". His reason for not believing the alleged existence of this king is "that the Pali canon indubitably asserts that Udayibhadda was the son of Ajātasattu and probably also his successor. Otherwise the reign of the father and son would extend over eighty-three years[2]".

But the Vāyupurāṇa equally *indubitably* asserts that Udāyin was the son of Darśaka, '*Udāyî bhavitā tasmāt*,' etc. (37.312). It cannot be generally predicated of either the Purāṇas or the Pāli canon that the chronological data of the one set are absolutely worthless and that of the other absolutely reliable. Each datum has to be judged on its own merit, and this for a long time before we could have a presumption in favour of one of the two classes of our documents. An individual historical detail might be found satisfactory in one class, while in respect of another, the other would probably prove to be more reliable. The question in the case of every datum could only be solved in the light of accumulating new materials and advanced researches.

In the case of Darśaka we are now in possession of a piece of evidence which goes to confirm the datum of the Purāṇas as to his historical existence.

Three of the works of the dramatist Bhāsa who has been enumerated at the head of his predecessors-in-art by Kālidāsa in his *Mālavikā-Agnimitra*, have been discovered and published by the Government of Travancore. Out of these the *Pratijñā-Yaugandharāyaṇa* (serial No XVI, 1912) is based on the love story of Udayana and Vāsavadattā with details which are far more probable than what we have got related in the Buddhist literature.[3] The hero of the play is the faithful Yaugan-

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[1] Pali Text Society, 1912.

[2] i.e. the period covered according to the Purāṇas by the alleged reigns of Ajātaśatru, Darśaka and Udāyin.

[3] For instance, here in Bhāsa it is not to know the secret of the charm for capturing elephants that Udayana is spared by Pradyota and then asked to teach it to his daughter from outside a curtain (Rhys Davids, *Buddhist India*, p. 5). Here as a prisoner of state he is asked to teach the Princess Vāsayadattā music of which Udayana was considered

dharāyaṇa, one of the ministers of Udayana, king of the Vatsas and of Kauśāmbî.

Another of the published plays of the same author is (No. XV, 1912) the *Svapna-Vāsavadattā*,[1] the chief work of Bhāsa as is evidenced by numerous notices of it in the Sāhitya literature. This forms a sequel to the Pratijñā-Yaugandharāyaṇa. 'To secure the prosperity of Kauśāmbî', the ministers, with a half-willing permission and co-operation of the Queen, circulated a false rumour to the effect that the Queen Vāsavadattā was destroyed by the fire which burnt down the camp at Lāvaṇaka. The ministers succeeded thereby in bringing about their master's second marriage with the Princess Padmāvati of Magadha.

That this Udayana was a contemporary of the Buddha we gather from the Jātakas.[2] His father was Parantapa and son Bodhi[3] according to the Jātakas. In the Vishnupurāṇa Udayana's father is called "Śatānîka", which is apparently a title. His real name Parantapa appears in the Vāyu-Purāṇa in its corrupt reading "Paripluta". His son, of whose succession we are not told by the Buddhist writers, appears under the name Medhāvî as Udayana's immediate successor in the Purāṇa.[4] The Purāṇas, therefore, tally here with the Buddhist accounts.

Before discussing the historical data in Bhāsa, I may be

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a master. The introduction to the fair pupil is not barred by any curtain, and things developed as Pradyota had intended them to develop. There is no occasion here for the master to call his pupil "you hunchback", as described by the commentator of the Dhammapada, and then to discover a charming lady.

[1] We cannot be sure whether the title was intended to be the *Vāsavadattā*, *Svapna-Vāsavadattā* or *Svapna-Vāsavadattam*. There are conflicting pieces of evidence on the subject, specially with regard to the latter two. *Vide* the *Sva. Vāsva.* (No. XV), p. 77 n., for the evidence of the manuscript in favour of the *Vāsavadattā*; Rājaśekhara's expression "Svapna-Vāsavadattasya" in favour of the title adopted by the learned editor of Bhāsa's plays (ibid., p. xxi); and in favour of "*Svapna-Vāsavadattā*," the evidence of another manuscript at p. xxi. The author of the Amarakośa-ṭîkā-Sarvasva (cir. 1159 A.C.) has it as *Svapna-Vāsavadattam*, while the famous critic Bhāmaha (9th century A.C.) calls the work *Svapna-Vāsavadattā* (ibid., p. xxii).

[2] Rhys Davids, *Buddhist India*, p. 8; Fausböll, J. 3. 157.

[3] Rhys Davids, pp. 7–8.

[4] The Vāyu, 37. 270. The Vishnu introduces five names after Medhavî and duplicates Udayana along with his father and four later generations. Against this we have in the Vāyu altogether three generations after Medhāvî. The Vishnu evidently had two versions of the names to draw upon, and introduced both, making the list longer. It is noteworthy that the line of Udayana comes to an end four generations later, and four generations later on the throne of Magadha we have Mahā-Padma who according to the Vāyu destroyed all the Kshatriya-houses and established a "one-king-sovereignity" (37, 320—322). On the evidence of the Vāyu. I am inclined to hold that Kshemaka, the fourth successor of Udayana, was defeated and killed, and his kingdom incorporated with the Magadhan empire, by Mahā-Padma Nanda.

Udayana is misspelt in theVayu as *Sunaya*.

permitted to discuss here his age, which is necessary to form an idea about the antiquity of those data.

The Age of Bhāsa.

(I) Bhāsa, who is placed at the head of old (*purāṇa*) dramatist by Kālidāsa, must be considerably earlier than the fifth century of the Christian era, the age of Kālidāsa now accepted by the Sanskritists.

(II) There is a difference of opinion as to the date of the *Mrüchchhakatika*. But whatever may be its date, Bhāsa must have lived before its author, for Bhāsa's *Chārudatta*, or *Daridra-Chārudatta*, is the basis of the Mrüchchhakatika, as is clearly seen from numerous parallels given by Mr. G. Śastrî in his learned introduction to the Svapna-Vāsavadattam.

(III) According to Bāṇa, the *prologue* in drama was an invention of Bhāsa.[1] And the prologue, which is much developed in the Mrüchchhakatika as well as in the plays of Kālidāsa, has generally the crudeness of the primary stage in Bhāsa's works.[2]

The *Nāndî*, an invariable feature of all other Sanskrit dramas, is outside the scope of the dramatist in Bhāsa. There it yet belongs to the domain of histrionics. His play begins with *Nāndyante tatah praviśati sûtra-dhârah* ('Enter Manager at the close of the Nāndî').

The *Bharatavākaya* is in its primitive stage, as I shall show below.

A change in location is effected by a new act, no direction as to locality is ever given, except as to the Nepathya. *Yavanikā* is mentioned (Sva. Vasav., p. 75), not to denote a curtain but a veil.

(IV) Bhāsa's language is absolutely free from the kāvya artificiality which we find as far back as the time of the Rudrādāman inscription (second century A.C.). There is not the slightest effort for alliteration; the very thing seems to be almost unknown to the author. He never uses long Samāsas. Also his conceits are never far-fetched Further, he discloses grammatical archaisms[3] which would appear as erroneous or almost erroneous to one familiar with the classical kāvya.

Similarly there are several more or less archaic expressions, which give us a clue as to the age of the author. The epithet

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[1] Sûtra-dhāra-krütārambhair nāṭakaih bahubhûmikaih | sapatākair yaśo lebhe Bhāso devakulairiva ||

Harshacharita I. 15.

[2] For instance, in the Vāsavadattā the Sûtra-Dhāra alone appears on the stage and introduces to the audience the theme of the performance. In another play, the *Karṇa-Bhāra*, there does not seem to be any introduction at all (S. Vāsava., p. xiii).

[3] S. Vāsava., pp. xlii, xliii.

"*Mahābrāhmaṇa*" is used in good sense,[1] as we have it in the ancient literature,[2] and not in the bad sense, that of the 'funeral priest' as we find it used in the Mahā-Bhārata. Likewise we get *Āryaputra*[3] and Ayyaputto in the sense of Kumara, 'Prince,' as in the Siddapur inscription of Aśoka. Again, in describing the proud family of Udayana, the *house of the Bharatas*, Bhāsa identifies it with the Bharatas of the Veda,[4] an identification forgotten when the Purāṇas were written and only brought to light and emphasized by European scholars of our days. *Yakshiṇî* occurs as a female evil spirit as in the early Buddhist literature.[5] In telling a story the sentence commences with "There was *King Brahmadatta*[6] of *Kâmpilya*"[7] in the familiar style of the Jātakas.

(V) Out of the twelve plays of Bhāsa yet discovered, nine pieces dramatise epic stories like those which were staged when the Mahā-Bhāshya was written. His *Pañchâ-Rātra* ("the Five Nights") has for its theme the exile of the Pāṇḍavas at the Virāta capital, the war between them and the Kauravas in the Virāta territory, and Duryodhana's promise, made before that war to Droṇa, to give half the kingdom to the Pāṇḍavas, if Droṇa discovered them in five nights—a version unknown to our present Mahā-Bhārata.[8]

The above considerations force upon us the conclusion that the works of Bhāsa are ancient in the classical Sanskrit literature and that as dramas they are the oldest yet discov-

[1] S. Vāsava., p. 42.

[2] Cf. Brühad-Āraṇyaka Up. ii, 19, 22.

[3] S. Vāsava., pp. 67, 69. The ambassador of Pradyota addresses the son-in-law of his master Udayana as Aryaputra.

[4] Vedākshara-samavāya-pravishṭo Bhārato Vaṃśah. *Prati.-Yaug.*, p. 34.

[5] S. Vāsava., p. 59.

[6] A rough calculation based on the date of the Purāṇas shows that Brahmadatta flourished about 250 years before the Buddha.

[7] S. Vāsava., pp. 54–55.

[8] There is another incident described which we do not find in the Mahā-Bhārata. Arjuna's son Abhimanyu fights on the side of Duryodhana against Virāṭa and is taken prisoner.

Other pieces on the Mahā-Bhārata are: the *Dûta-Ghaṭotkacha* based on some incident after the death of Abhimanyu: (2) the *Madhyama-Vyāyoga* which seems to have Bhîma-sena as its hero against Hidimvā; (3) the *Karṇa-Bhāra* or "The Responsibility of Karna"; (4) an unnamed play which apparently deals with a council held by Duryodhana before the war, and (5) the *Uru-Bhaṅga* or 'the Breaking of the Thigh' (of Duryo-dhana), S. Vasava., pp. viii–xv. (The information is gathered from the introduction to the *Svapna-Vāsavadatta* by Mr. Gaṇapati Śāstri).

When these plays are published by the Government of Travancore we shall probably be in possession of another version of the story of the Mahā-Bhārata as distinguished from that we have got in the present available Mahā-Bhārata. There are also two plays of Bhāsa on the story of Rāma after his return from the South, and one on the child Krüshṇa.

ered in this country. They appear to be older than the edition of the Mahā-Bhārata which we have to-day and which can be safely placed about the third century A.C.[1] The lowest limit of the age of Bhāsa would be thus cir. 250 A.C.

In considering the earlier limit we are guided by these facts :—

(I) Buddhism is so familiarly known to the author that one of the chief characters—the minister Rumaṇvat—disguises himself as a Śramaṇa.[2] This familiarity is an indication of the post-Aśokan period.

(II) The works depict a society which had just adopted Buddhist institutions in the orthodox system, i.e. the society of the first orthodox revival (second and first centuries B.C.). We have the Queen-Dowager of Magadha living the life of an orthodox nun.[3]

(III) At the same time there is an anti-Buddhistic tendency noticeable. The Śramaṇa is hated by the Brahmin.[4] The Budddhist layman seems to receive a hit in the address 'O mad-upāsaka'[5]; and the Śramaṇa is on the whole ridiculed as being no better than a conjurer.[6] The Śramaṇa is hated and ridiculed, but at the same time he is tolerated. This I take to point out the closing period of the anti-Buddhistic Brahmin Empire of the Śuṅgas and Kāṇvas.

(IV) At the end of his plays Bhāsa gives a benedictory verse which is substantively one and the same. It mostly reads as follows :—

Imāṃ sāgar-paryantāṃ himvadvindhya-kundataṃ, Mahiṃ = ekāta patraṅkāṃ rāja-simhah praśāstunah.''

[इमां सागरपर्यन्तां हिमवद्विन्ध्यकुण्डलाम् ।
महीमेकातपत्राङ्कं राजसिंहः प्रशास्तुनः ॥]

"Let our Raja-Simha rule with sole sovereignity (lit. 'under one umbrella') over this land up to the ocean encircled between the Himalayas and the Vindhyas."

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[1] Amongst other things, the tribe of Kanishka (Tushāras) are mentioned in the Śānti-Parva (LXV, 13–15) *amongst foreigners living under Hindu Kings*. The Hûṇas are not in that list, and their mention elsewhere does not prove their presence within India when the Mahā-Bhārata was cast in its present form. It is not unlikely that they were known to the Hindus in the first and the second centuries A.C. Communications with Tartary and China were very frequent in the early centuries of the Christian era.

[2] Prati.-Yaug., pp. 43–44. [3] S. Vāsava., p. 4.

[4] "Shame on my Brahmin-hood that I shall be offered peace (refuge, abhaya-dāna) by a Śramaṇaka, a wealth-seeker." Prati-Yaug., p. 43.

[5] "*Unmattopāsaka.*" Prati.-Yaug., p. 43; also see p. 64.

[6] Ibid., pp. 45–46.

Now, before the time of Kālidāsa and before the present Mahā-Bhārata, the fact of having a 'one-umbrella empire' extending from the Himalayas to the Vindhyas and up to the Ocean, could only refer to a period which cannot go back farther than the days of Chandragupta Maurya and could not be remembered later than the rise of the Andhra-Bhrütyas and the Kushans, i.e. it must refer to a period somewhere between 325 B.C. and the end of the first century B.C. The upper limit of 325 B.C. has to be brought down to a time after Aśoka, in view of (*a*) what has been said in paras. (II) and (III) and (*b*) the site of the Siddapur edict of Aśoka which is trans-Vindhyan, and also the general trend of Aśoka's language which was prone to talk of 'all-India'. *Thus we would be brought to the later Mauryan and the Suṅga-Kāṇvan period.*

The above territorial description of Bhāsa coincides with the definition of the Āryāvarta of the Mānava-Dharma Śāstra, which, as I have shown elsewhere,[1] seems to have been written under the reign of Pushyamitra (cir. 160 B.C.). As Bhāsa knows the Mānava-Dharma Śāstra,[2] we might presume that about 100 years would have elapsed between the composition of the Mānava-Dharma-Śāstra and the dramas of Bhāsa.

(V) The benedictory verse refers to the reigning ('our') sovereign. It is pronounced by any character who happens to be the last spokesman on the stage, e.g. by Droṇa in the Pañcharātra, by Yaugandharāyaṇa in the Paratijṇā-Yaugandharāyaṇa, by King Udayana in the Svapna-Vāsavadattā.[3] *Râja-Simhā* was not therefore Udayana's or Droṇa's but Bhāsa's 'sovereign-lion'.

In one case we get another word, *Upendra*, in the place of Rāja-Simha.[4] In the *Madhyama-Vyāyoga*, the bharata-vākya, or, to be more accurate, the last verse (for the expression bharata-vakya is not to be found there) runs thus:—

> "As the Samudra is the lord (*prabhavah* sic) of rivers, as fire is the lord of offerings, as even mind is the lord

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[1] The legal journal, the *Calcutta Weekly Notes*, 1911, Nos. 41 and 42. *Cf.* Kohler, *Archiv für Reschts-und Wirtschafts philosophi* (1912) V. 4.

[2] S. Vāsava., p. xxix. It also knows the work 'Rāmāyaṇa.'

[3] This is, as observed above, another instance of undeveloped stage of the technique of Hindu darma in Bhāsa. Sometimes there is no bharata-vākya given at all, e.g. in the *Chārudatta* (S. Vāsava., p. viii), in the *Ghaṭotkacha* (ibid., p. ix), in the *Uru-bhaṅga* (ibid., p. xvii).

We notice a very important practice here—the practice of alluding to the reigning king in the bharata-vākya. This might help us in discovering the names of reigning sovereigns in other plays lying hidden under artistic, kāvya obscurity. The *Mūdrā-Rākhasa* has "*Srimad-Bandhu-bhrütyah Chandra-guptah.*"

[4] Only "our king", *nah rājā*, is mentioned in the *Pratimā* (S. Vāsava., p. xix).

of the organs of senses, so our lord (lit. master) is the majestic Upendra.''[1]

This *Upendra* seems to be alluded to quite in the opening line in the Nataka which is not named in the manuscript of Mr. Gaṇapati Śāstrî.[2] A more pointed *slesha* may be found in the first verse of the *Avimāraka* where Upendra is replaced by *Nārāyaṇa*:

''May the majestic *Nārāyaṇa* rule for you this earth under lofty one umbrella'', etc.[3]

Upendra and Nārāyaṇa are equivalent terms; which of the two is the proper name of the 'master' of Bhāsa[5]? What is, again, the connection between *Upendrā* or *Nārāyaṇa* and *Rāja-Siṃha*? And who were they? Either they mean one person, or two persons, they were undoubtedly orthodox; and amongst the orthodox rulers of the second and first centuries B.C. there is one name to correspond to or coincide with either Upendra or Nārāyaṇa—*the Kaṇvāyaṇa Nārāyaṇa*. I am inclined to identify the Kāṇva Nārāyaṇa with Bhāsa's Upendra and Nārāyaṇa (about 53–41 B.C.). Upendra = Narayana is not called 'the sovereign' but 'master'. It is possible that ''our King'' and ''our Rāja-Siṃha'' denoted the *unnamed* 'Śuṅga of the Vāyupurāṇa (37. 338 Bibli. Ind. ed.),[4] and Upendra ['the master'], the sovereign-minister Nārāyaṇa, the Kāṇva.[5]

The date thus found is quite in agreement with other lines of evidence noticed above. It is also noteworthy that histrionics seems to have enjoyed a special popularity in the Śuṅga period, as is evidenced by the references in the Mahā-Bhāshya, the theatre at the Jogimārā cave, and the recorded notorious devotion to the stage of Sumitra, son of Agnimitra.

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1 Yathā nadînāṃ prabhavah samudro, yatha-āhutînāṃ prabhavo hutāśah | Yathendriyaṇāṃ prabhavaṃ mano' pi tathā prabhur nah bhagawān Upendrah || S. Vāsava., p xiii.

2 ''pādah pāyād-Upendrasya.'' S. Vāsava., p. xv.

3 S. Vāsava., p. ix. Cf. the first word in the Dûta-Ghaṭotkacha ''Narayanastribhuvanaika'' etc. S. Vāsava., p. viii.

4 The passage of the Vāyu has been discussed by the present writer in his paper on 'the Brahmin Empire', where the conclusion about the number of the Śuṇgas come to is that there were twelve Śuṇgas who sat on the throne.

5 The proposed identification of the Nārāyaṇa of Bhāsa with Nārāyaṇa Kāṇva is very strongly supported by my friend Mr. P. Chaudhuri's discovery in the *Dûtā-vākya* (which has been published since my writing the above paper) of a passage whe re' Nārāyaṇa' is taunted for enjoying ''the fame of the country taken away from Brühadratha.'' बार्हद्रथा-पहृत विषय कीर्त्तिभोग: There is no Prühadratha in the Mahā-Bhārata whose country was taken away by Krühṇa. It is a clear allusion to the unfortunate Brühadratha Maurya, with probably a remote pun implying Janor-Sandha who was a Brühadratha. The pieces published later leave no room to doubt that the name of Bhāsa's master was Nārāyaṇa.

Probably the Vāsavadattā and the Pratijñā Yaugandharāyaṇa of Bhāsa were based on the famous ākhyāna-work, the *Vāsavadattā*, noticed in the Mahā-Bhāshya. And allowing even fifty years for the earlier career of the Vāsavadattā of the Mahā-Bhāshya, the traditions upon which Bhāsa most likely has drawn, would be only 250 years removed from the reign of Darśaka.[1] If we confine ourselves to the date of Bhāsa, on the evidence of Kālidāsa alone, the data in Bhāsa must be placed earlier than the Mahāvaṃśa by a century. If we take other pieces of evidence into account, they are apparently older by five centuries.

The Historical Data in Bhāsa.

Now let us take the historical data in Bhāsa. These data are :—

(I) That Udayana, son of Śatānîka and grandson of Sahasranîka,[2] the lord of Kauśambî,[3] ruling over the Vastas, belonged to the noblest, proudest house, the race of the Bharatas whose pedigree stood "penetrated into the very letters of the Veda", and to whom the science of music had come as an heirloom.[4]

(II) That he was a son-in-law to and contemporary of Pradyota, the Mahāsena, King of Avantî, ruling at Ujjayinî.[5]

(III) That he contracted a political marriage[6] with Padmāvati, Princess of Magadha and sister to the sovereign of

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[1] 137 years, the Maurya period (=before Patañjali).
40 ,, the Nanda period. Mahāpadma Nanda, 28 years (Vāyu, 37. 322, ashṭavimśati varahāṇi; it is *not* 88 in the Vāyu, as supposed by European scholars) and his son, 12 years (Vāyu, 37, 322).
118 ,, Udāyin, Nandivandhana and Mahānandî.
295
—50 ,, for earlier career of the ākhyāna.
245

[2] Prati. Yaug., p. 30.
The Kathā-sārit-sāgara confounds the two and makes Udayana the son of Sahasrānîka. The *Lalitavistara* designates Udayana's father as *Satānîka*.

[3] Kauśambîśah Vatsa-rājah. Prati. Yaug., p. 31.

[4] Ibid., p. 34.

[5] Prati. Yaug. and S. Vāsava., *passim*. On *Mahāsena* see S. Vāsava., p. 20; Prati. Yaug., p. 34. The Kathā-sarit-sāgara has got Mahāsena as a proper name and regards Pradyota as a distinct individual.

[6] S. Vāsava., p. 76.
Rāja—Vayasya Yaugandharāyaṇa Devyapanaye kā krütā te buddhih.
Yaug.—Kauśāmbi-matrāṃ paripalayāmîti.
[King—Yaugandharāyaṇa, why this thy psychology to harm the Queen?
Yaug.—For I wanted to serve the whole of (the state of) Kauśāmbî.]

Magadha—the *Emperor Darśaka*,[1] ruling at the time at Rājagrüha.[2]

(IV) That this "Vatsa territory", which was separated from the frontier of Magadha by the Ganges,[3] was apparently a separate unit under Udayana, whose original kingdom was Kauśāmbî with its neighbourhood. The Vatsas as distinct from Kauśambi revolted under one Aruṇi or Araṇi soon after the Magadhan marriage of Udayana while the King was still at Rājagrüha, and were put down by the combined forces of Kauśambî and Magadha.[4]

On the authority of the Jātakas, Pradyota was a contemporary of Ajātaśatru, and Udayana survived the Buddha.[5] After the Buddha's death Ajātaśatru ruled for 27, according to the Buddhist documents, and 27 or 17 years according to the reign-period assigned to him by the Purāṇāsa (Wilson & Hall, Vishṇu P. iv, p. 181, *n.*) It is not therefore improbable that Udayana survived Ajātaśatru also, being presumably a generation younger than Pradyota, the contemporary of Ajātaśatru. We may also safely presume that 25 years after Ajataśatru's death Udayana, if living, must have been a man of about 70.[6] This would indicate that his marriage with "the Princess of Magadha" and "the sister of Darśaka" must have taken place, say 25 years earlier than this latter figure[7] and Darśaka must have flourished likewise at the same time. As a matter of fact we are told by the Purāṇas that Darśaka immediately succeeded Ajātaśatru and that he reigned for 25 years. Thus in view of these considerations, we can draw the conclusion that Draśāka, who did flourish as an emperor of Magadha, immediately succeeded Ajātaśatru.

The above considerations would exclude an hypothetical insertion, between Ajātaśatru and Darśaka, of Udāyin who is

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[1] *Mahārāja-Darśakasya bhaginî Padmāvatî.* S. Vāsava., p. 4, eshā sā Magadha raja-putrî Padmāvatî. S Vāsava., p. 5.

[2] This is again important, for this shows that the tradition was still green as to the former capital Rājagrüha when Bhāsa wrote. Rājagrüha was, a generation or two later, abandoned by the successors of Darśaka in favour of Pāṭaliputra. The latter capital is never mentioned by Bhāsa.

His references to the house of Kāśi (Prati. Yaug., p. 29) which had disappeared a generation even before Ajātaśatru is another reminiscence of ancient history.

[3] S. Vāsava., pp. 11, 60.

[4] S. Vāsava., p. 60. Cf. also the patriotic reply of Yaugandharāyāṇa "For I had to serve the whole of Kauśāmbî", as against the Vatsas.

[5] Rhys Davids, pp. 8, 13.

[6] Taking him to be 30 at the death of the Buddha, if Ajātasātru ruled for 25 years.

[7] In view of the second marriage (in the reign of Darśaka, i.e. after the death of the Buddha), we would be sceptic about the statement in the Lalita-Vistara that Udayana was born on the same day as the Buddha.

placed immediately after Ajātaśatru in the Pāli chronicles. If we accept even the Mahāvaṃśa period of 16 years for the reign of Udāyin (against 33 years of the Vāyu), and take Udayana to be only about 20 years old at the death of the Buddha, his Magadhan marriage (which I take to be an historical fact) would fall some time about his sixty-third year (20 + 29 + 16 = 63), which would hardly be probable in face of the traditions in Bhāsa, the *Ratnāvali* and the *Kathā-sarit-sāgara*, all of which depict Udayana young at his subsequent marriage or marriages. The latter two, indeed, paint him as a regular youthful Don Juan, exaggerating no doubt the fact of his second marriage.

Then, there is another ground for rejecting a proposal to place Udāyin between Ajātaśatru and Darśaka. Udāyin, according to the Vāyu, in his fourth year, made Kusumpura (Pātalîputra), on the southern bank of the Ganges, his capital, while, according to Bhāsa, in the days of the Darśaka, the capital was still at Rājagrüha.

The reason of the Magadhan marriage of Udayana becomes intelligible and also some light is thrown on the above question of chronology, if we take into account the political relations between the different states of the time. The state which in the days of the Buddha and Ajātaśatru claimed to dominate over others was neither Magadha nor Kośala, it was Avantî. The King of Avantî is called the *Mehāsana*, "He of the large army", in Bhāsa, and *Chaṇḍa*, "the Terrible", in Buddhist works.[1] In the latter again we are told that Ajātaśatru stood on the defensive against him, fortifying his capital in expectation of an invasion from Ujjayini.[2] Before reaching Rājagrüha Pradyota would have had to pass through the territory of Kauśambî, along the ancient highway. Before launching upon this intended expedition, Pradyota must secure the good-will or subjugation of the sovereign of the Vatsa[3] territory. To gain this object he seems to have

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[1] Rhys Davids, p. 28. [2] Ibid., p. 13.

In respect of this theory of the dominating position of Avantî, I may refer to the order in which the Pradyotas have been placed in the Vāyu and the subsequent Purāṇas. These Pradyotas are not Magadhan sovereigns as supposed by some writers. They are Vîtahotras (*Vîtahotreshu vartishu*, Vāyu, 37. 303). Pradyota and his son Pālaka of the Purāṇas are (Pradyota) Mahāsena and his son Pālaka of Ujjayinî of the Kathā-sarit-sāgara. The Pradyotas are placed above the Śiśunāgas, because after the extinction of the Brïihadrathas of Magadha the Pradyotas held the premier place amongst the Hindu states of the time. The Jaina tradition also reckons its chronology from Pālaka before the Nandas (amongst whom they obviously include some of the Śiśunāgas). In the struggle against Magadha the Pradyotas seem to have succumbed three generations later.

[3] The revolt of the Vatsas under Aruṇi related by Bhāsa might have been connected with these political marriages. It is almost contemporaneous with the Magadha alliance. Probably it was fostered by the 'terrible' Pradyota or, more likely, by his successor.

schemed, and, in a way, forced the marriage of his daughter upon Udayana. The effect of this political marriage is evidently sought to be neutralized by another political marriage, that of the Princess Padmāvati with the King of Vatsa,[1] who would naturally have been a lukewarm ally of Pradyota. Being a buffer between Magadha and Avantî he would have welcomed the new alliance which Yaugandharāyaṇa describes as brought about "for the welfare of the whole of Kauśambî." The second marriage followed the first. It however took place when Ajātaśatru had passed away, and Darśaka was on the throne at Rājagrüha.

In the light of our data from Bhāsa the record in the Dvîpa-Vaṃśa and the Mahā-Vaṃśa in respect of the succession of Udāyî or Udayibhadda must be, I think, admitted as inaccurate. I propose here an explanation of the error in the Pāli documents. The name next to Udayibhadda has been transposed, and hence all the confusion. I read *Nāgadāsaka* which is placed after Udayibhadda, as *Nāga Darśaka* and identify the latter with *Darśaka*; and the *Nāga* I take to be a member of the epithet the Śaiśu-*nāga*.[1] The reign-period of Darśaka (25) is the same as that of Nāga Dāsaka (24), the difference of a year being accountable on the basis of the well-known difference of one year which often arises owing to the two different reckonings of Hindu chronologists.

To sum up, there cannot now remain any reasonable doubt as to the historical existence of Darśaka, nor about the spelling of his name. Nor could it be said now of him that nothing is known of him.[2] Also the fact is clear that we cannot accept the Pāli authority on the point.

The view advanced here on the political significance of these marriages is supported by the emphatic and clear opinion of the Kathāsarit-sāgara as to the political importance of the Magadha marriage (Tawney, pp. 112–113).

[1] Śiśunāga thus must be one of the predecessors of Darśaka before Ajātaśatru and Bimbisāra.

[2] V. Smith, Early History of India, 1908, p. 44. "Darśaka or Harśaka, nothing known."

35. Lakṣmaṇasena.

By R. D. Banerji, M.A., *Indian Museum, Calcutta.*

The present discussion is based on four stone inscriptions discovered in the Gayā District:—

I. An inscription, which is at present stuck in the walls of a small shrine of Sūrya near the Viṣṇupāda at Gayā dated the year 1813 of the Nirvāṇa era.—According to this inscription a king of the Kamā (Kumaon) country, named Purusottamasiṁha, seeing that the religion of Buddha was in a declining state, sought the help of two neighbouring kings, King Aśokacalla of the Sapādalakṣa (Savālakh) mountains and the king of the Chindas, and restored the religion to its pure state. The main object of the inscription was to record the erection of a temple (*Gandhakuṭī*) for the spiritual benefit of Māṇikyasiṁha, the son of Ratnaśrī, the daughter of Puruṣottamasiṁha. The construction of the building was carried on under the supervision of the monk Dharmmarakṣita, the spiritual adviser of Purusottamasiṁha.[1]

II. The Bodh-Gayā inscription of the year 51 of the Lakṣmaṇasena era recording the erection of an image of Buddha and certain other donations by Aśokacalla-deva.—It was discovered by Mr. J. D. Beglar at Bodh-Gayā and indifferent photographs were published in Cunningham's *Mahābodhi*. Subsequently all traces of it were lost In 1907, Mr. A. H. Longhurst of the Archæological Survey purchased it, along with some other sculptures and inscriptions which are now in the Indian Museum.[2] The last two lines of this inscription run as follows:—

(12) *Śrīmal = Lakhvanasenasy*[3] *= ātīta-rājya-saṁ* 51.

(13) *bhādradine* 29.

III. The Bodh-Gayā inscription of the year 74 of the Lakṣmaṇasena era recording an unspecified donation by one Sahanapāla, the treasurer of the prince Daśaratha who was the younger brother of king Aśokacalla-deva of the Khasa country in the Sapādalakṣa mountains.—The inscription was discovered by Mr. V. Hathorne at Bodh-Gayā. Prinsep published his version of the text with an eye-copy in an early volume

[1] A.S.R., Vol. III, p. 126, pl. XXXV. Ind. Ant., Vol X, p. 341.

[2] J.B.B.R.A.S., Vol. XVI, p. 359; Cunningham's Mahabodhi, p. 78, pl. XXVII A.

[3] Or Lakṣvana.

of the Journal of the Asiatic Society of Bengal.[1] Rājendra Lāla Mitra[2] and Bhagwan Lal Indraji[3] could not trace it at Bodh-Gayā. I saw the inscription on the walls of a modern building to the north of the sculpture shed at Bodh-Gayā. Its present position was already known to the late Dr. Th. Bloch of the Archæological Survey. Recently Dr. Fleet has stated that either Aśokacalla or Daśaratha of this inscription was Jaina,[4] because Bhagwan Lal read the word *Jinendra* in the first line. But this reading is not correct. Besides, the word *Jinendra* is a well-known epithet of Buddha. The first line reads as follows :—

Namo Buddhāya Deyadharmmoyaṁ pravara-mahāyānayāyinaḥ paramopāsakasya Hevajra-caraṇ = āravinda-makaranda-madhukara-phalakāra nṛpati ve-

The word *Hevajra* is distinct even in Mr. Hathorne's eye-copy. It is also a well-known epithet of the Bodhisattva.[5] The last two lines run as follows :—

Śrīmal = Lakṣmaṇasena-deva-pādānām = atīta
rājya-saṁ 72 Vaiśākha vadi 12 *Gurau.*

IV. Bodh-Gayā pavement slab inscription of the time of Aśokacalla-deva.—This record, unfortunately, is not dated. Cunningham published a bad photograph of it. The complete text has not been published as yet. It opens with an invocation to Buddha and seems to record certain donations. The regular terms of announcement, as found in copper-plate grants, occur in ll. 4-5, and Aśokacalla-deva is mentioned in l. 8, and Dharmarakṣita, the spiritual adviser of the king of the Kamā country, who is already known to us from inscription no. I, in ll. 9-10.

The elders of the Ceylon Congregation (*Siṁghala-sthavirānāṁ*) are mentioned in ll. 15-16, and two officers, the *Sādhanika Brahmacāṭa* and the *Māṇḍalika Sahajapāla*. These two officers are mentioned in inscription no. III. Cāṭabrahma is the father of Sahajapāla who afterwards became the treasurer of prince Daśaratha. The name of Sahaṇapāla in inscription no. III is most probably a mistake for Sahajapāla. In inscription no. III the name of Sahajapāla's father is written as Cāṭabrahma, but instances of such transformation are not wanting.

In a recent number of the Journal of the Royal Asiatic Society Dr. Fleet has expressed a doubt about the identity of the Aśokacallas mentioned in the four inscriptions quoted

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1 J.A S.B., Vol V, p. 658, pl. XXX.
2 Buddha-Gaya, p. 199.
3 Ind. Ant , Vol. X, p. 346.
4 J.R.A.S. 1909, p. 348
5 Bendall's *Subhāsita samuccaya*, Cambridge, 1891, p. 5.

above. Their identity, however, may be established in the following way:—

Aśokacalla is associated with the bhikṣu Dharmmarakṣita in inscriptions nos. I and IV. In both inscriptions Dharmmarakṣita is styled *Kamā-rāja-guru* and consequently it must be admitted that the Aśokacallas mentioned in these two inscriptions are one and the same personage. Again, the officers of the king mentioned in inscription no. III are also mentioned in inscription no. IV; consequently it must be admitted that the Aśokacallas mentioned in inscriptions no. I, III and IV are one and the same person. Inscription no. II does not give any detail about the king, but he is most probably the same as the one mentioned in the remaining inscriptions. The correct reading of the name of the king seems to be Aśokacalla as first read by Bhagwan Lal.[1] Cunningham's emendation does not appear to be correct.[2] The name is spelt *Aśokacalla* in inscriptions nos. I and III and *Aśokavalla* in nos. II and IV. The former have been neatly and carefully incised, but the latter have been very carelessly done and are full of spelling mistakes. Consequently the spelling in the neater inscriptions should be followed. There is practically very little difference between *va* and *ca* in inscriptions nos. II and IV.

The most important point in these inscriptions are the dates in no. II and III. The use of the word *atīta* in expressing the date is peculiar, and various scholars have translated it in various ways. Some twenty years ago Dr. Kielhorn called attention to this point in his article on the era of Laksmaṇasena.[3] He proved beyond doubt that the initial year of the Laksmaṇasena era was equivalent to Śaka 1041 and not Śaka 1028. The modern almanacs of Tirhut, on which the former theories were based, are not reliable and the grant of Śivasiṁha which has been published by Dr. Grierson is, undoubtedly, a forgery.[4] The use of *atīta*, *gata* or similar words are rare in connection with regnal years. There is only a single instance of the use of similar words in Dr. Kielhorn's list of Northern Indian inscriptions[5] which I believe is to be interpreted differently. Dr. Kielhorn's opinion on this point is worth quoting:—

"During the reign of Laksmaṇasena the years of his reign would be described as *Śrimal=Laksmaṇasena-devapādānām rājye* (or *pravardhamāna-vijaya-rājye*) *saṁvat*; after his death the phrase would be retained, but *atīta* prefixed to the word rājye, to show that, although the years were still counted

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[1] Ind. Ant., Vol. X, p. 342.
[2] Mahabodhi, p 78.
[3] Ind. Ant., Vol. XIX, p. 1.
[4] Proc. A.S B. 1895, p. 144, pl. III.
[5] Ep. Ind., Vol. V., App. No. 166.

from the commencement of the reign of Laksmaṇasena, that reign itself was a thing of the past."[1] Dr. Kielhorn's translation of the last sentence of inscription No. III possesses the advantage of being clearer than those of his predecessors in the same field. It leaves no doubt about the fact that the use of the word *atīta* is a clear indication of the cessation of Laksmaṇasena's reign. Further on he says:—

"When we are told that, at the conquest of Bengal by Muḥammad Bukhtiyar, which by Mr. Blochmann is placed about A.D. 1198-99, the last Hindu King Lakhmaniyā had been reigning for 80 years, does not this really mean that the conquest took place in the year 80 of Laksmaṇasena-era,—Śrīmal-Laksmaṇasenadevapādānām = atītarājye sam 80?"[2]

From his synchronistic list for Northern India[3] (A.D. 700-1400) published subsequently, it appears that Dr. Kielhorn had then abandoned his theory.

In 1896 Babu Nagendra Nāth Vasu in his article "Chronology of the Sena Kings of Bengal"[4] quoted some verses from *Dānasāgara*, a work said to be composed by Ballālasena, according to which Ballālasena was alive in 1169 A.D. Within a very short time Dr. R. G. Bhandarkar published his sixth report on the Search for Sanskrit Manuscripts in the Bombay Presidency. In his report another work of Ballālasena, named *Adbhuta-sāgara*, has been noticed at length.[5] According to the verses the evidence against Dr. Kielhorn's theory may by summed up as follows:—

(1) Two manuscripts of Dānasāgara, by Ballālasena, King of Bengal, contain the following passage:—

Nikhila-cakra-tilaka-śrīmad-Ballālasenena pūrṇe
Śaśi-navadaśamite śakavarṣe Dānasāgaro racitaḥ.

One of these MSS. is in the India Office collection[6] and in this the date is given in numerical figures also The other is in the possession of Babu Nagendra Nātha Vasu.[7] This manuscript contains two more verses elucidating the date:—

Ravibhagaṇāḥ śaraśiṣṭā ye bhūtā dānasāgarsy = āsya
Kramaśo'tra samparidānudādyā vatsarā pañca
Tad-evam eka-navaty-adhika-varṣa-sahasrāre'nvite śāke
Saṁvatsarāḥ patanti Viśvapadārabhya ca.[8]

(2) A manuscript of *Adbhutasāgara*, another work by

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1 Ind. Ant., Vol. XIX, p. 2, note 3.
2 *Ibid.*, p. 7.
3 Ind. Ant., vol. VIII.
4 Proc. and J.A.S.B. 1896, pt 1, p. 23.
5 Report on the Search for Sanskrit MSS. in the Bombay Presidency during the years 1887-88, 1888-89, 1889-90 and 1890-91.
6 Eggeling's India Office Cat., Pt. III, p. 545.
7 Śāstrī's Notices of Sanskrit MSS., 2nd series, Vol. I, p. 170.
8 J.A.S.B. 1896, pt. I, p. 23.

Ballālasena, now in the collection of the Bombay Government, contains the following verse:—

Kha-nava-kh = endv = abde ārebhe adbhūtasāgaraṁ
Gauḍendra Kuñjarālāna-stambha-vāhur = mahīpateḥ.[1]

The agreement of the date from two different works seems to prove beyond doubt that Ballālasena was alive in s. 1090-91, i.e. 1168-9 A.D. Consequently it had to be admitted that Lakṣmaṇasena came to the throne after 1169 A.D. But Dr. Kielhorn had already proved that the initial year of the era of Lakṣmaṇasena is equivalent to 1119-20 A.D. In order to reconcile these incongruities Babu Nagendra Nāth Vasu propounded the following theory:—

According to the *Laghubhārata* Ballālasena was away fighting in Mithilā when it was rumoured that he was dead. At that time Lakṣmaṇasena was born at Vikramapura. "This news pleased him so much that in his newly conquered kingdom he inaugurated a new era, which he named the Lakṣmaṇa era."[2]

So far as is known at present, nobody has looked into the genuineness of the evidence brought against Dr. Kielhorn's theory. The manuscript of *Dānasāgara* in the private collection of Babu Nagendra Nāth Vasu is not very old. It is written in modern Bengali characters and Mahamahopādhyāya Hara Prasād Śāstrī who has examined it carefully, informs me that its approximate age is about two to three hundred years The copy in the India Office collection is said to be written in modern Bengali handwriting[3] and consequently it cannot be much older than Nagendra Babu's MS. There is a copy of the same work in the collection of the Asiatic Society of Bengal.[4] This is also written in modern Bengali characters, and is very nearly free from mistakes. In this copy none of the three verses quoted above can be traced, though the verses containing the genealogy of the Sena Kings are given.

These verses are also absent in a copy of the same work in the library of the Mahārājā of Pāthuriāghāṭā.[5] This manuscript was copied in Śaka 1728, i.e., 1806 A.D. Thus we have four manuscripts of the same age and of these one manuscript contains three verses of which one only occurs in another manuscript while they are absent in the remaining two Taking these facts into consideration it seems quite safe to state that these verses are interpolations. The first verse about the date

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[1] Report on the Search of Sanskrit MSS. in the Bombay Presidency, 1887-88, 1888-89, 1889-90 and 1890-91, p. lxxxv.
[2] J.A.S.B. 1896, pt. I, p. 23.
[3] Eggeling's India Office Cat., Pt III, p. 545.
[4] MS. No. I, A., 78.
[5] Rajendra Lala Mitra's Notices of Sanskrit MSS., 1st series, Vol. I, p. 151.

was added at first and we find it in two manuscripts. The other two verses were added later on and consequently they are not to be found in any other copy.

The verses quoted by Dr. R. G. Bhāṇḍārkār are also to be found in one manuscript only. There are several other manuscripts of *Adbhutasāgara* by Ballālasena in various parts of India but these verses do not seem to occur in any one of them :—

(1) A manuscript in the Raghunātha temple at Kāshmīr.

(2) A manuscript in the collection of the Asiatic Society of Bengal.[1]

(3) An incomplete manuscript in the Bombay Government collection.[2]

(4) A manuscript in private possession noticed by Mahāmahopādhyāya Hara Prasād Śāstrī.[3]

(5) To these may be added a manuscript in the India Office collection.[4]

The ms. in the India Office collection certainly does not contain these verses ; otherwise Dr. Eggeling would have quoted them. I have personally examined the ms. in the collection of the Asiatic Society of Bengal. The information about the rest of the mss. is less reliable, as the Indian catalogues of Sanskrit mss. are not very accurately compiled.

It has already been stated that the majority of mss. quoted above are modern copies, and, even if we take for granted that the verses in the *Dānasāgara* and *Adbhutasāgara* were not interpolated, but formed parts of the original works by Ballālasena, there is a big question still to be decided, *viz.* whether evidence based on very modern copies of mss. can be put forward against the testimony of contemporary epigraphical records ? There is very little doubt about the fact that literary evidence, when based on proper authorities, is as much authentic as epigraphical evidence. Nobody has yet expressed any doubt about the historical value of *Kāmacarita*, the commentary of which is written in Bengali characters of the eleventh century A.D.,[5] or the colophons of the Buddhist Sanskrit manuscripts from Nepal written in characters of the eleventh and twelfth centuries A.D.[6] But manuscripts copied in the eighteenth and nineteenth centuries of the Christian era can hardly be regarded as proper bases for evidence to be adduced against proof based on inscriptions five or six hundred years

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[1] Government No. 1193.

[2] Report on the Search for Sanskrit MSS. in the Bombay Presidency, 1883-84.

[3] Sastri Notices of Sanskrit MSS., Vol. II.

[4] India Office Cat.

[5] Memoirs A. S. B., Vol. II, Rāmacarita of Sandhyākara Nandī by Mahāmahopādhyāya Hara Prasāda Śāstrī. Proc. A.S.B., 1900, p. 70.

[6] Proc. A.S.B., 1899, p. 39.

earlier in date. These two works, *Dānasāgara* and *Adbhutasāgara*, if really composed by King Ballālasena of Gauḍa, they must have been copied innumerable times beforehand. The carelessness and ignorance of the scribes are well known. Dr. Bhandarkar says, "Some of them (verses) are unintelligible owing to the corruption of the text."[1]

Another factor that contributes to unreliability of modern mss. is interpolation, and very often it is difficult to realize which parts of a work are original and which interpolated. Inscriptions, on the other hand, are contemporary original records. Their palæography proves beyond doubt whether they are forgeries or not. Evidence based on such records cannot be set aside in favour of evidence culled from modern copies of mss. said to be ancient. I cannot understand what led Dr. Kielhorn to abandon his former views when he had such sure ground to stand upon.

The extracts quoted above from Dr. Kielhorn's article on the Laksmaṇasena era clearly indicate that the author was of opinion that Laksmaṇasena had ceased to reign in *La-saṁ* 51, i.e. 1170-71 A.D. Most probably he had died before this time. The theory put forward by Babu Nagendra Nāth Vasu is directly opposed to the epigraphic evidence. Lakṣmaṇasenadeva who ceased to reign before 1170-71 A.D. could not have come to the throne after 1168-69 A.D. as two at least of his copper-plate grants were issued in his third year. The initial year of the era of Laksmaṇasena was beyond doubt the year of his accession. Babu Monmohan Chakravartti has reopened the discussion recently.[2] He thinks that the era was founded by Sāmantasena and on the accession of Lakṣmaṇasena it "was either formally adopted or made so widely prevalent that the era came to be known as Lakṣmaṇasena's." The author has cited several dated inscriptions in support of his theory. But he has not considered two very serious objections.

(1) None of the inscriptions quoted by him contain the word *atīta* or any of its equivalents.

(2) None of the Indian eras, now known, seem to have been started by one king and adopted and renamed by any one of his successors. At least there is no direct evidence in support of such a view.

The other theory put forward by Babu Nagendra Nāth Vasu is based on a rumour (*pravāda*). Moveover, the establishment of an era by a father in the name of his newly-born son is unheard of, and the evidence produced in its support is not at all trustworthy.

Before we proceed to examine the statements of the

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[1] Report on the Search of Sanskrit MSS. in the Bombay Presidency, 1881-89, p. lxxxii.

[2] Proc. and J.A.S.B., Vol. I, p. 45.

Muhammadan historians on this point, we should examine the state of Bengal and Bihar immediately before the Muhammadan conquest. It is quite certain that Govindapāladeva ruled over a portion of Magadha immediately before the Mussulman conquest. We know from the Viṣṇupāda temple inscription that he came to the throne in or about the year 1161 A.D.[1] and his fourteenth regnal year was equivalent to Vikrama Samvat 1232. This inscription of Govindapāladeva also contains the word *gate*. It is evident from the analogy of the inscriptions already quoted that his reign must have been a thing of the past at Gayā in 1175 A. D. But he was not dead at that time, because a manuscript written in the 37th year of his reign has been discovered by modern scholars. The following references to the reign of Govindapāla have been discovered as yet.

(1) The Viṣṇupāda temple inscription, Vikrama year 1232, regnal year 14.

"*Śrīmad-Govindapāladevānāṁ gata-rājye Caturdaśa samvatsare.*"

(2) A manuscript of the Aṣṭasāhasrikā-Prajñāpāramitā, at present preserved in the library of the Royal Asiatic Society of London, in which the final colophon runs as follows :—

Parameśvara-Paramabhaṭṭāraka-Paramasaugata-Mahārājādhirāja-Śrīmad Govindapālasya-vijayarājya-saṁvat 4.

(3) A manuscript of the well-known lexicon Amarakoṣa preserved in the Library of the Asiatic Society of Bengal, in which the final colophon runs as follows :—

Paramabhaṭṭāraketyādi-rājāvalī-pūrvvavat-Srī-Govindapālīya, saṁvat 24 *Caitrā sudi* 8 *śubhamastu-sarvva-jagatām-iti.*

(4) The last leaf of a manuscript of *Astāsāhasrikā Prānāpāramitā* preserved at the same place, in which the last two lines contain the following historical reference :—

4. *Śrīmad-Govindapāla-devasy-ātīta*
5. *Saṁvat* 18 *Kārttika-dine* 15.

(5) A manuscript of the Guhyāvalī-vivṛti by Ghaṇadeva preserved in the University Library, Cambridge, in which the final colophon runs as follows :—

Govindapāladevānām saṁ 37 *śrāmanadine* 11 *likhitamidaṁ.*

(6) A manuscript of the Pañcākāra belonging to the same collection as above possesses this unique colophon :—

6. . . . . *Paramēsvaretyādi-rājāvalī-pūrvvavat-śrīmad-Govindapāla-devānām vinaṣṭa-rājye Aṣṭatriṁśat-samvatsare.*

[1] A.S.R., Vol. III, pl. xxxviii, No. 18. Kielhorn's No. 166.

(7) A manuscript of the Aṣṭasāhasrikā Prajnā-Pāramitā, mentioned by Mahāmahopādhyāya Hara Prasād Śāstrī in the Journal of the Asiatic Society of Bengal, 1893, Pt. I, p. 253, which was copied at Jayanagara in the Magadha-maṇḍala (modern Jaynagar near Laksmisarai Station, E. I. R., District Monghyr). "The manuscript was copied in the 38th year of Govindapāla who was styled Gaudēśvara" . . . . .

"Govindapāla had certainly lost this kingdom before that time because his kingdom is not mentioned as a pravardhamāna-vijaya-rājya, as usual, but as an atīta-rājya, i.e. that his kingdom was lost and he was living perhaps as a fugitive."

(8) A manuscript of the Yogaratnamālā preserved in the University Library, Cambridge, in which the final colophon runs thus :—

1.4. *Paramēsvaretyādi-rājāvalī-pūrvvavat Śrīma.*
1.5. *-d = Govindapāladevānām saṁ* 39 *bhādra-dine* 14 . . .

Only one among these records speaks of King Govindapāla's reign as *vijayarājya-samvatsare*, "the year in the victorious reign." Three records state that the king had ceased to reign because the word *gate* in no. 1, *atīta* in no. 4 and no. 7 and *vinaṣṭa* in no. 6 cannot be interpreted otherwise. In three records the scribe refuses to give the titles of the king in full, e.g. no. 3, no. 6 and no. 8, and begins with the phrase :—

Paramesvaretyādi or Paramabhaṭṭāraketyādi.

In one record, only no. 5, the historical reference is given without any qualifying adjective.

It must be admitted on the evidence of no. 2 that the King Govindapāla was alive and reigning in the 4th year from his succession (1165 A D.) and that Nālanda was included in his dominions as shown by the manuscript copied at that place. We have two records of the 14th year of the king, one of which comes from Gayā. In the case of no. 1 the mention of the word *gata* indicates that the reign of Govindapāla had ceased in Gaya, and in the case of no. 3 the omission of the full Imperial titles denotes that the place where the manuscript was copied had ceased to be a part of Govindapāla's dominions. Of such cases two things may be affirmed :—

(1) that King Govindapāla had ceased to reign owing to death or abdication, or
(2) that the area of the dominion of that prince was gradually becoming circumscribed.

The latter explanation is to be preferred as one ms. of his 37th year does not refer to his reign as expired. This is confirmed by a ms. of the 38th year copied by the same scribe

who mentions the extinction of his kingdom A manuscript copied in the 39th year of the king gives abridged titles indicating that the king had finally ceased to reign. The reference in a record to the reign of a king who had ceased to reign over those parts is curious. Probably Buddhists did not want to refer to the reign of a king who, though king *de facto*, was not a Buddhist in faith. When the king had finally ceased to reign, and all Indian kingdoms had been indiscriminately destroyed in Bihar and Bengal, the scribe had only to indicate the date of the dethroned prince with abridged titles and adjectives denoting that his reign was already a thing of the past.

We know from the Bodh-Gayā inscription of the 51st year of the Laksmaṇasena era, that Bodh-Gayā and its adjacent parts were in the possession of the Sena kings. This is indicated by the use of the era of Laksmaṇasena which could not have been used by a king of a distant country like Aśokacalla of Sapādalakṣa, if Gayā did not happen to be included in the territory of the Senas. The Gayā inscription of v.s. 1232 on the other hand shows that once the country belonged to Govindapāla, but it had ceased to do so in the 14th year of his reign. So one can immediately infer that Gayā and its adjacent parts were wrested from Govindapāla by one of the Sena kings. King Govindapāla perhaps managed to retain his hold on the hilly tract between the modern districts of Gayā and Pātnā and was finally dethroned by the Muhammadan occupation of Uddaṇḍapura (modern town of Bihar) in the 38th year of his reign.

The Bodh-Gayā inscription of *La-saṁ* 74 proves that Gayā and the country around it continued in the possession of the Sena kings of Bengal.

Nothing is definitely known about the dissolution of the empire of the Pālas. The last king of the Pāla dynasty, whose name has come down to us, was Madanapāladeva. According to the *Rāmacarita* of Sandhyākara Nandi, this Madanapāla was a contemporary of Candra-Deva of Mahdaya (Kanauj)[1] :—

Siṁhīsuta vikrānten-ārjjunadhāmnā bhuvaḥ pradīpena Kamalāvikāśa bheṣajabhiṣajā Candreṇa bandhunopetām (-tām) Caṇḍīcaraṇa-saroja-prasāda-sampanna-vigrahaśrīkaṁ.

Na khalu Madanaṁ sāṅgeśamīśam-agād jagad-vijaya-lakṣmīḥ.

Consequently, it must be admitted that Mr. Venis's assignment of the date of the Kamauli grant of Vaidyadeva[2] is not correct. The true date must lie somewhere between 1026 A.D. and 1090 A.D. The first date is that of the Sārnāth

[1] Rāmacarita of Sandhyākara Nandi, Memoirs A.S.B., Vol. II.
[2] Epi. Ind., Vol. II, p. 256.

inscription of Mahipāla[1] and the second that of the *Candrāvatī* plate of Candra-Deva.[2] Nothing is known about the Pāla kings during the first sixty years of the twelfth century. Govindapāladeva ascended the throne in 1161 A.D. It is generally supposed that he belonged to the Pāla dynasty but there is no direct evidence in support of this statement. But two things are in favour of the above statements. His name ends with the word *Pāla* and he was a Buddhist. Even after his destruction Buddhist scribes have continued to use his name in the *colophons* of manuscripts for several years.[3] The extent of his kingdom is uncertain. But as has been already observed, he ruled over a portion of Magadha or South Bihar and was gradually losing ground before the Senas. He had a long reign of thirty-seven years. If the *Tabaqāt-i-Nāsirī* is to be trusted then the modern city of Bihār was his last stronghold.[4] He was crushed by the Mussulmans in the 38th year of his reign (1199 A.D.).

During the first sixty years of the twelfth century of the Christian era remnants of the Pāla empire seem to have become the prey of the neighbouring kings. Govindacandradeva of Kanauj invaded Magadha in 1146 A.D. and advanced as far as *Mudgagiri* or Mungīr. According to one of his copper-plate grants discovered in the village of Lār in the Gorakhpur district, Govindacandra, when in residence in Mudgagiri, bestowed a certain village in the Gorakhpur district on a Brāhmaṇa, after bathing in the Ganges on the occasion of the Akṣayā Tṛtīyā.[5] This does not indicate a friendly visit but most probably indicates that Govindacandra overran Magadha in 1146 A.D. Twenty-five years afterwards, we find that Gayā is in the possession of the Senas of Bengal. A continuous struggle must have been going on between the Pāla kings and the Sena kings for their possessions in Magadha, and it took a final turn by the appearance of Turks on the scene who wiped out both the kingdoms. The Sena kings of Bengal were orthodox Hindus, while Govindapāla was a Buddhist, and probably they were not on good terms. It is even hinted in one of the Bengali works on the *Dharma* cult discovered by Mahāmahopādhyāya Hara Prasād Śāstrī that the Buddhists helped the Muhammadan invaders materially. Dharma is stated to have assumed the garb of a *Yavana* (*Muhammadan*) and donned the black cap.[6] Thus, to sum up, we find that

[1] Annual Report of the Archl. Survey. of India, 1903-04, p. 222 pl. lxiii, No. 3.

[2] Epi. Ind., Vol. IX, p. 302.

[3] Bendall's Cat. of Sans. MSS in the Univ. Liby., Cambridge, Buddhist Sans. MSS.

[4] Raverty's Translation of the *Tābaqāt-i-Nāsirī*, Bib. Ind.

[5] Epi. Ind., Vol. III, p. 98.

[6] Mahamahopadhyaya Hara Prasād Sastri's "Discovery of living Buddhism in Bengal," p. 28.

Bihar or Magadha was the prey of the neighbouring monarchs immediately before the Muhammadan conquest. Gahaḍavālas, Senas and Pālas were trying one after another to secure it for themselves, and consequently, when the kingdom of Kanauj fell, neither the Pālas nor the Senas made any effort to uphold it. When Muḥammad-i-Bakẖtiyār began to lead marauding expeditions to Maṇer and Bihār, the Pāla king was too weak to defend himself and the Sena king too much occupied with internal affairs or family quarrels to properly fortify his marches.

In Bengal proper, we find that two sons of Lakṣmaṇasena, Viśvarūpasena and Keśavasena, succeeded him on the throne. Both of them are known from copper-plate grants. Keśavasena has also been mentioned in the Āīn-i-Akbarī. In Colonel Jarrett's translation it is spelt Kesu-sen[1] which corresponds to Sanskrit *Keśava-sena*. A copper-plate grant of Keśavasena was published by Prinsep in 1838.[2] But his reading of the king's name has not generally been accepted. In 1896 Babu Nagendra Nāth Vasu stated that the king's name should be read as Viśvarūpa[3] and his view was adopted by the late Dr. Kielhorn in his list of Northern Indian Inscriptions.

Babu Nagendra Nāth has corrected the reading of the 10th verse in 1·17. His reading of the last words of the verse is undoubtedly correct. But he has overlooked the fact that the last proper name in the metrical portion is that of Keśavasena and the same name occupies the place allotted to the donor, *cf.* 40—43.[4]

The proper reading of the plate is:—

Śrīmal-Laksmaṇasenadevapādānudhyāta samasta-suprāśasty-upetāśvapati-gajapati-narapati-rājā trayādhipati Somakula-vikāsa-bhāṣkara Somavaṁśapradīpa-pratipanna Karṇa Satyavrata Gāṅgeya śaraṇāgata-vajrapañjara mahārājādhirāja ari rāja-asahya-śaṅkara Gaudeśvara Śrīmat-Keśavasenadevapāla-vijay--inah.

Similarly we have—

Śrīmal-Lakṣmaṇa-sena-devaḥ kuśalī.

in the Tarpandighi and Anulia grants of Lakṣmaṇasenadeva and

Śrī-Viśvarūpasenadeva-padavijayinaḥ

in the Madanapāḍa grant of Viśvarūpasena. If the Bakarganj grant was issued by Viśvarūpasena, why do we find another name in the place generally occupied by the donor's name?

Babu Nagendra Nāth Vasu came to a premature conclusion when he corrected the following verses of the Edilpur grant:—

[1] Jarrett's Āīn-i Akbarī (Bib. Ind.), Vol. II, p. 146.
[2] J.A S B., Vol. VII, pt. I, p. 44
[3] *Ibid.*, Vol. LXV, pt. I, p. 8. [4] *Ibid.*, Vol. VII, pt. I, pl. IV.

[*N.S.*]

L. 17 . . . *Etasmāt kathamanyathā ripu badhū vaidhavya vaddhavrato vikhyāta kṣitipāla maulir-abhavat Śri-Viśvavandyo* into :—

Etasmāt kathamanyathā ripubadhū . . . . . Śri-Viśvarūpo nṛpaḥ.

On the ground of this correction Babu Nagendra Nāth has stated that the Elilpur grant also was issued by Viśvarūpasenadeva and not by Keśavasena. Evidently he has taken the term *Viśvarūpo* to be a proper name and not an adjunct. But if *Viśvarūpo* is taken to be a proper name, we shall have to admit that the verses following this refer to Viśvarūpasena and not to Lakṣmaṇasena. Consequently Tāḍā-devī must be acknowledged to be the queen of Viśvarūpasena and not Laksmanasena. Finally we shall have to acknowledge that Viśvarūpasena was the son of king Viśvarūpa by the queen Tāḍā-devī.

In reality the Edilpur grant was issued by Keśavasena, a son of Lakṣmaṇasena, whose *biruda* was *arirāja-asahyaśaṅkara-Gaudeśvara.* Thus the existence of two sons of Lakṣmaṇasena is proved by their inscriptions. It has already been stated above that the Edilpur grant of Keśavasena contains all the verses of the Madanapāḍa grant and some more in addition. The immediate inference from this is that Viśvarūpasena was Keśavasena's predecessor.

The Edilpur grant twice mentions Keśavasena, and in each case it is quite evident that some name has been erased and *Keśavasena* engraved in its place. But the space is quite sufficient for the new name. In the Madanapāḍa grant the name *Viśvarūpa* occurs twice and in each case it is evident that the engraver was very much in want of space. The effect was that the four letters are smaller than the other letters in the same line. Most probably a name consisting of three syllables was erased and the name Viśvarūpa consisting of four syllables engraved in its place. The *Aīn-i-Akbarī* mentions a king named Mādhū Sen after Lakhan Sen. This name wrongly transliterated is evidently Mādhava Sena, and, if Atkinson[1] is correct, we possess a record of this king also which however has still to be deciphered. If we assume that in the Madanapāḍa grant the name of Mādhava was erased and Viśvarūpa engraved in its stead, we have the following genealogy of the Sena kings of Bengal :—

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[1] E. Atkinson's Kumaun, p. 516; see J.A.S.B., 1896, pt. 1, p. 28, note 1.

Vīrasena.
|
Sāmantasena
|
Hemantasena
|
Vijayasena
|
Vallālasena
|
Lakṣmaṇasena
|
Mādhava Sena (?) Viśvarūpasena. Keśavasena.

The genealogical tables of Kulācāryas of Bengal also state that Keśavasena was the *king* who quitted Gauḍa.[1] These genealogical works are not generally noted for accuracy, but in this case the corroboration at least might be of some value. Thus in Bengal two or three sons of Lakṣmaṇasena actually succeeded him at Gauḍa. The last of them, Keśavasena, was driven away by the Muhammadans and took refuge in an Eastern Kingdom. The name of the king of this realm is not known, but it is evident from the verses quoted by Babu Nagendra Nāth from the *Kārikā* of Eḍu Miśra, that he was not a vassal of the Senas of Bengal.

Summarily, the condition of Bengal and Bihār, immediately before the Muhammadan conquest, was very miserable. The last Buddhist king of Magadha ruled over a country a few miles only in extent. The country was ravaged by civil war between the Buddhist and the Hindu and between the Pālas and the Senas, and, even when the mighty Jayacandra fell, there was no awakening in Bihār and Bengal. Eastern Bengal formed a separate kingdom most probably under a successful rebel. It is not known whether the Sena princes were quarrelling among themselves or not. But the fact that some follower of Mādhavasena escaped to Garḥwāl with a copper plate is significant. It shows that there was trouble among Hindus too. Otherwise why should the possessor of a *Tāmraśāsana*, who must be a Brāhmaṇa,[2] go and settle with his records in Garḥwāl? Evidently, there was a civil war among the Sena princes and the vanquished prince escaped to the far North. It may be that he had become intimate with Aśokacalladeva or Dasaratha, his brother, when they were at Bodh-Gayā on

[1] J.A.S.B., Vol. LXV, 1896, pt. 1, p. 24.

[2] The only known exceptions are the grants of Jayacandra of Kanauj to the Kṣatriya Rājyadharavarman.
Ind. Ant., Vol. XVIII, pp. 134—43.

pilgrimage. This disturbance must have taken place before the fall of Kanauj, as the whole of Northern India was in a very disturbed state during the last decade of the twelfth century A.D. on account of depredations of the Turkish banditti. Within the short space of thirty years three princes followed each other on the throne of Bengal. Consequently when Muḥammad-i-Bakhtiyār began his raids in Bihār, the Buddhist king was too weak and insignificant to repel him and the Hindu king too much occupied with his own troubles to attend to the peace of his Western border. His governors most probably were not strong enough to check these depredations. Emboldened by his success, Muḥammad-i-Bakhtiyār advanced up to Manēr, near the junction of the Sone with the Ganges. Even the Sone was crossed and in one of his expeditions he stormed the monastery of Bihār. It was hardly a glorious exploit for the invader. What he imagined to be a fort was merely a strongly built monastery on a scalable hill-top which to a foreigner looked like a fort from a distance. The postern was carried by an assault, as the garrison must have consisted of simple rustics hastily gathered together to defend their gods and priests. The king himself must have become old and his garrison under him must have been very small because the raids of these merciless, uncouth barbarians had struck terror into the hearts of the population. The harmless ignorant peasantry had not known such terrors since the days of the Hūṇas, the Huns of European history, when wave after wave of flat-nosed white Tartars swept away the ancient Empire of the Guptas. Eastern India had been free from Nomad marauders for six centuries before the Muhammadan conquest. This immunity from foreign inroads led to the final conquest of India by the Mussulmans. The invasions of Sulṭān Maḥmūd of Ghazni were mere inroads, there being no attempt to settle in the country and subjugate it thoroughly. The monastery of Bihār was taken in the 38th regnal year of Govindapāladeva, which is equivalent to 1199 A.D.[1] Consequently we must reject the dates proposed by Raverty and Blochmann[2] for the Muhammadan conquest of Bengal. If we are to credit the *Tabaqāt-i-Nāṣirī*, we must admit that the Muhammadan invasion of Bengal took place in 1200 A.D. The *Tabaqāt-i-Nāṣirī* is the only reliable source, as the author was almost contemporaneous with the events he relates. The author visited Bengal forty-two years after the conquest,[3] and his account of the invasion of Bengal seems to be based on the narratives of old soldiers.[4] Later Muhammadan historians

[1] J.A.S.B., 1876, pt. I, pp. 331-32.
[2] *Ibid.* 1875, pt. I, p. 276. On this point compare Babu Monmohon Chuckerbutty, J. & P. A.S.B., Vol. V, p. 51.
[3] Raverty's Translation of the *Tabaqat-i-Nasiri*, p. 663.
[4] *Ibid.*, p. 552.

have copied the account of the invasion of Bengal from Minhāj's book and consequently are not worth much more. They gloat over the invasion and treat it as a mighty performance and exaggerate the importance of the conqueror beyond all measure. Raverty has done full justice to them in his translation.[1]

According to the *Tabaqāt-i-Nāṣirī*, Muḥammad-i-Bakhtiyār Khiljī, the conqueror of Magadha and Gauḍa, was a native of Ghūr He left his country in search of employment and after various adventures found a permanent footing under Malik Husāmuddīn Aghulbak of Oudh. From his possessions in Oudh he began to lead plundering expeditions into South Bihar (Magadha). Emboldened by success, he gradually widened the field of his operations and finally took possession of the monastery of Bihār, the last stronghold of Buddhism in North-Eastern India. The fame of his wealth and exploits drew large numbers of his countrymen to his service and with their help he invaded Eastern Bengal a year after the reduction of Bihār (1200 A.D.).

From this point the *Tabaqat-i-Nāṣirī*, instead of helping us, leads only to confusion. The first important blunder is the mention of Laksmaṇasena as the then king of Bengal and the description of his flight. I have already proved that at that time Kesāvasena was on the throne of Bengal and Laksmanasena had ceased to reign even before 1170 A.D. The next blunder is the raid on Nadiah. The account of this expedition is very meagre and has the appearance of being hastily made up. Either the narrator failed to make himself clearly understood or Minhāj was not paying sufficient attention to the narrative. Minhaj's account of the conquest of Bengal consists of the following words :—

"The following year after that, Muḥammad-i-Bukhtyār caused a force to be prepared, pressed on from Bihar, and suddenly appeared before the city of Nudiah, in such wise that no more than eighteen horsemen could keep up with him."[2]

The statement in itself looks very simple and nobody seems to have examined it carefully. Three different roads may be followed to reach Nudiah from Bihar :—

(1) From Bihār to Bhagalpur or Mungīr, then across the Ganges to Gauṛ and finally to Nudiah, after crossing the Ganges again along the eastern bank of the Bhāgīrathī.

(2) From Bihār to Nudiah through the hilly districts of Choṭā-Nāgpur and Birbhum almost parallel to the modern railway lines.

(3) Through the pass at Sāḥibganj along the southern

[1] *Ibid.*, p. 558.
[2] Tabaqat-i-Nasiri (Raverty's Translation), p. 557.

bank of the Ganges and the western bank of the Bhāgīrathī, crossing the Bhāgīrathī at Nudiah.

Minhāj has given no description of the route followed by the invaders, and it is evident that his store of information was very scanty. Out of the three routes mentioned above the third and the last one is the most practicable one, and it is suited for cavalry manœuvres. The first one involves the crossing of the Ganges twice, which seven hundred years ago was no light matter. The second route is very difficult, as it lay through a mountainous country and independent aboriginal tribes. The Santhals of that period were not so docile, and the chieftains of Mallabhúmi were strong enough to repel a body of invaders like that which a man of Muḥammad-i-Bakhtiyār's status could muster. The third route has been generally followed by the invaders of Bengal and most probably the first Muhammadan invader of Bengal also followed it. The story of the great haste of the leader and his conquest of Nudiah with the aid of seventeen horsemen needs no explanation. The whole narrative is the result of hasty arrangement of ill-digested materials. First of all we have no authority to state that Nudiah or Navadvīpa was the capital of the Sena kings. According to the *Pavanadūtaṁ* of Dhoyī, the capital of the Sena Kingdom in Laksmanasena's time was *Vijayapura* in the Suhma country.[1] Babu Monmohan Chakravarttī has identified Vijayapura with Navadvīpa but I think hardly anything can be cited in support of this identification. Most probably this vaunted invasion of Bengal was one of the raids of Muḥammad-i-Bakhtiyār, in which he terrified a small unimportant holy place (*tīrtha*) into submission. The account of the flight of Lakṣmanasena is one of the grossest misrepresentations ever found in modern historiography. The reigning king Keśavasena was most probably put to flight. Bengal was at that time torn by internal dissensions and no attempt worth mentioning seems to have been made either by the Sena kings or their feudatories to put a stop to these depredations. Muḥammad-i-Bakhtiyār seems to have wrested from them the tract between Bihār and Gaur (Gauḍa or Lakhnauti) in his lifetime. The southernmost limit was Lakhanor or Lakhnor, which most probably was situated in the modern district of Birbhum or Bankura. The raid on Nudiah did not lead to the conquest of Bengal from Bihār to Nudiah. The evidence against such a conclusion is very clear. In fact Nudiah was not conquered till the time of Mughiṣuddīn Yuzbak. Minḥājstates, "After Muhammad-i Bakhtiyar possessed himself of that territory (Rae Lakhmaniah's), he left the city of Nudiah in desolation, and the place which is (now) Lakha-

[1] Proc. A.S.B. 1898, p. 192. [2] Proc. & J.A.S.B., Vol. I, p. 45.

nawati he made the seat of Government." Muḥammad i-Bakhtiyār must have turned back from Nudiah and then occupied Lākhnauti or Gaur. The King of Jājnagar (Orissa) invaded Bengal in 1243-44 A.D., and at that time Lakhnor was the southernmost stronghold of Muhammadans. Finally we have a silver coin of Mughiṣudbīn Yuzbak struck to commemorate the final conquest of Nudiah in 653 A.H. = 1255 A.D.[1] There is hardly any other way of explaining the legend on this coin, the proper reading of the margin of which seems to be:—

هذه الضرب بلكدوتي من خراج كربردن و نوديا في رمضان سنة ثلث و خمسين و ستماية *

It seems that *Varddhana Kuti* is mentioned as *Gar Bardan*. The coin is unique at present. It was described by Dr. A. F. R. Hoernle,[2] who mentions a duplicate. The legend is identical with that on a silver coin of Altamsh, which must have been struck to commemorate the conquest of Qanauj.[3] Similarly, we have the Kamrup coin of Sikandar bin Iliyās Shāh of Bengal commemorating the invasion of Assam.[4] The Qanauj coin of Altamsh is a more perfect parallel, as the wording is identical. Fresh discoveries have proved beyond doubt that, after the death of Jayacandra in the battle fought with Muhammadans near Etawah, the Gahaḍavāla Kingdom was not wiped out. It seems that the Muhammadans succeeded in overrunning the country along the southern bank of the Ganges only. The Ganges-Jumna Doab and Oudh was in the possession of the son of Jayacandra. Though we find mentions of Oudh in Minhāj's book, it is now quite sure that they held portions of it only. The Machlishahar grant of Hariścandra[5] issued in v. s. 1257 = 1200 A.D. shows that the son of Jayacandra was still a reigning monarch. This discovery lends an additional support to the theory that the final conquest of Qanauj took place at least ten years after the death of Jayacandra. Consequently it has to be admitted that the final conquest of Nudiah took place in 1253 A.D. The next step was taken 43 years later when the descendants of Balban were reigning independently in Bengal. Saptagrāma, the part of Southern Bengal, was reduced in 1298 A.D. by Muḥammad Ẓafar Khān, who became its first Governor.[6]

The actual territory conquered by Muḥammad-i-Bakhtiyār was very small in area, extending only to Deva-Kota or Deo-

[1] Cat. of Coins in the Indian Museum, Vol. II, pt. II, p. 146, No. 6.
[2] J.A.S.B. 1881, pt. I, p. 61.
[3] Cat. of Coins in the Indian Museum, Vol. II, pt. I, p. 21. The correct reading is قنوج and not. فنّوج
[4] *Ibid.* Vol. II, pt. II, p. 152, No. 38.
[5] Annual Report of the Archl. Surv., N. Circle, for 1908, pp. 20—21.
[6] P. & J.A.S B , Vol. V.

Kot in the North and Lakhnor in the South. The eastern boundary was indefinite. The most important point in the account of the Muhammadan conquest of Bengal[1] would have been the siege and reduction of Gauḍa or Gaur, but this point was passed over in silence. The conqueror Muḥammad-i-Bakhtiyār Khiljī is generally taken by the later Muhammadan historians to be the General of Qutbuddīn Aibak. Thus we have :—

I. "The Sultan was overwhelmed with astonishment to see this and nominated and appointed him ruler of the whole country of Lakhnauti in Bengala and sent him away."[2]

II. "And the Kingdom of Bengal as an adjunct of the Empire of Delhi was left in the hands of Qutbuddin. Sultan Qutbuddīn entrusted to Malik Ikhtiyaruddīn Muḥammad-i-Bakhtiyar Khiljī the Viceroyalty of the Provinces of Bihar and Lakhnauti."[3]

The Tabaqat-i-Nasiri, which is the sole authority of all Muhammadan historians for this period, says nothing of the kind. Muḥammad-i-Bakhtiyar was a free lance, who by dint of perseverance and indomitable courage and the distracted state of the country carved out a kingdom for himself. The only regular invasion he had attempted ended in failure, viz. his invasion of Northern Bengal and the submontane tracts of Āssam. The rest of his invasions were the raids of a free-booter. He had no connection either with the kings of Ghur or his Viceroy in India.

In April 1911 an inscription of the time of Laksmaṇasena-deva was discovered on the base of an image of the goddess Caṇḍī at Dālbazar in the town of Dāccā. There is an old *ghāt* on the banks of the river Buri, which is built entirely of blocks of stone, both carved and plain, brought from the ruins of Gaur. The entrance of this *ghāt* is built of fragments of carved mihr-abs of masjids. To the left of this entrance is a small modern brickbuilt shrine containing a *liṅga* and two images of stone, one of Caṇḍī and the other of Visnu. It was ascertained from the present owners of the ghāt and the temple that the images were brought from the ruins of Rāmapāla in the Dāccā District by a certain Babu Baikuṇṭha Nātha Sen, Deputy Inspector of Schools (now deceased) about thirty-five or forty years ago. The image represents a goddess with four hands standing on a fully-expanded lotus. She holds a lotus and a water-pot in her right hands, a battle-axe in her upper left and her lower left hand is in the posture of blessing. A female attendant stands on each side of her holding a fly-

[1] Tabaqat i-Nasiri (Raverty's Trans), pp. 572-73.

[2] Muntakhabu-t-Tawarikh (Trans. by Ranking in the Bib. Ind.), Vol. I, pp. 82-83.

[3] Riyazu s-Salatin (Trans. by Maulavi Abdus Salam in the Bib. Ind.), p 59.

whisk. The main figure stands under a sort of porch or niche probably intended to represent a temple. On the pedestal is the inscription in two lines on a plain band in front and a recessed corner on each side. Below this is a lion couchant in front with three devotees kneeling on three recessed corners on each side. On the top of the niche or shrine are two elephants, one on each side with vases in their upraised trunks as if they are pouring water over the head of the goddess.

The inscription runs as follows:—

A (1) Srī-mal = Lakṣmaṇa-
(2) sena-devasya sam 3

B (1) Maladei suta adhikṛta Damodre
(2) -ṇa Srī-Caṇḍīdevi samāravdhā tabhrādakana

C (1) Srī-Nārāyaṇena
(2) Pratiṣṭhit = etiḥ.

"[In] the year 3 of [the reign of] the illustrious Lakṣmaṇasenadeva [this image of] the goddess Caṇḍī was begun by the Judge Damodra (Damodara) ..... [*and*] was dedicated by the illustrious Nārāyaṇa."

The importance of this in cription is three-fold:—

(1) It is the only stone inscription of the time of Laksmanasena, which has been discovered up to date. The wording of the inscription, or more definitely the absence of such phrases as *gata* or *atīta*, proves definitely that the image was dedicated during the reign of Lakṣmaṇasena. The absence of further qualifying phrases, such as *pravarddhamāna-vijaya-rājye* or *Kalyāna-Vijaya-rājye*, does not really matter, since such phrases are from time to time found wanting in votive inscriptions. This is a well-known fact and examples are hardly necessary. This inscription when compared with those of Aśokacalla and Daśaratha, of the 51st and 74th years of Lakṣmaṇasena respectively, found at Bodh-Gayā, lead us to the conclusion that the form of wording the dates found in the latter inscription came into vogue after the decease or dethronement of Lakṣmaṇasena. The wording of the former inscription is indeed what one may expect in the wording of a votive inscription and is really the form used in them during the reign of Lakṣmaṇasenadeva. This inscription supplies the missing link in the chain of evidences which I have tried to set forth above and which tend to prove that Lakṣmaṇasena of Gauḍa was dead at the time of the Muhammadan conquest of Bengal.

(2) It is the oldest stone inscription in Eastern Bengal according to state of our knowledge at present.

(3) It proves that though Rāmapāla was not the Rāmavatī of Rāmapāladeva, it was a place of very great importance. But of this we shall have to say something more in another paper.

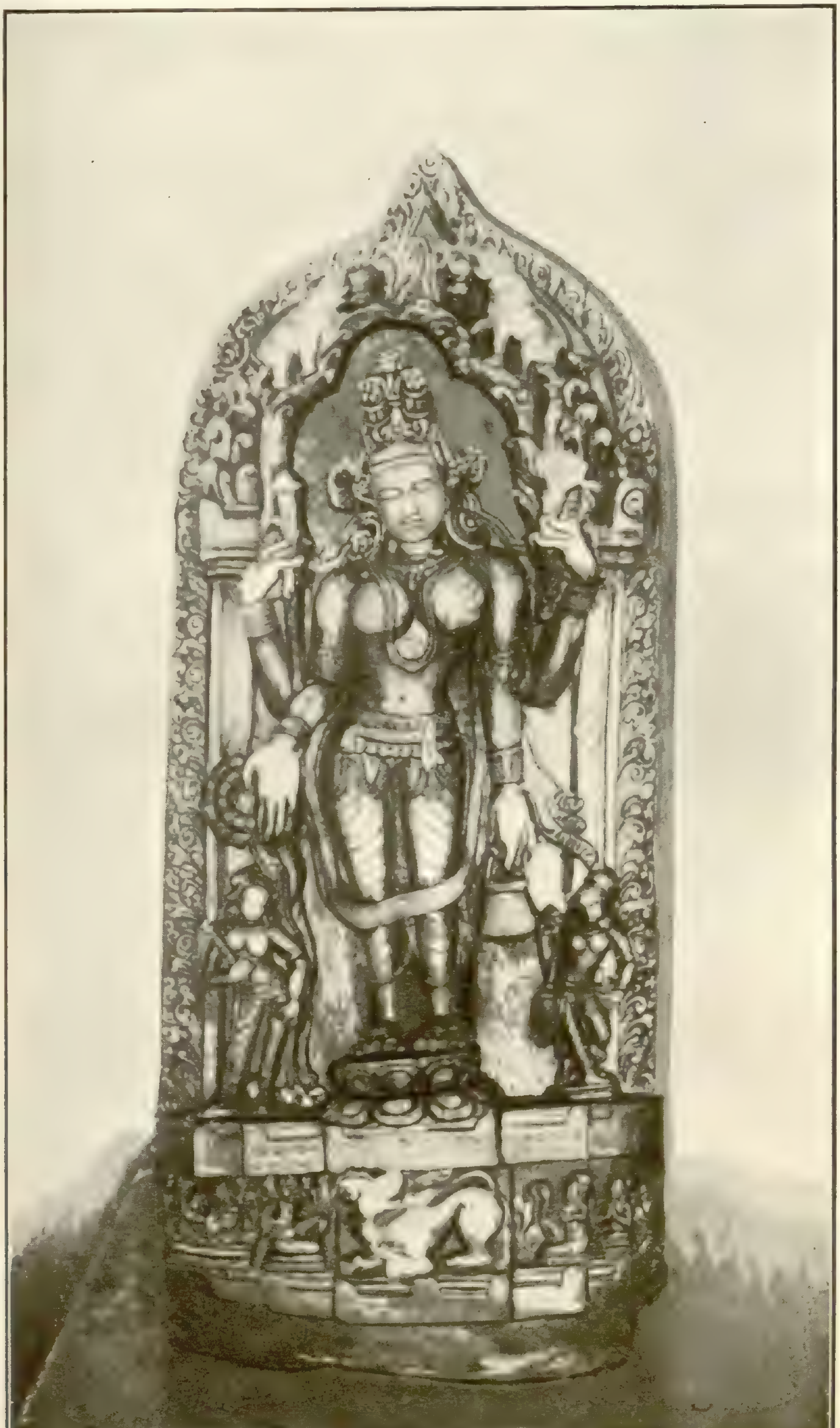
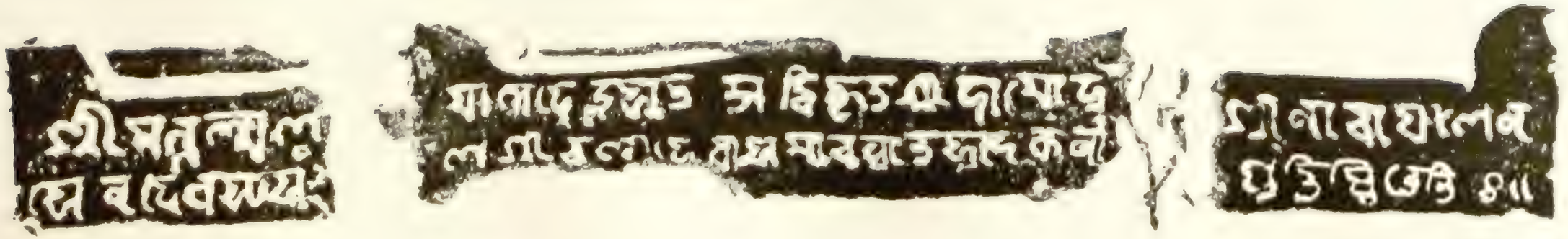


IMAGE OF CAṆḌI AT DACCA, DEDICATED IN THE 3RD YEAR OF LAKṢMAṆASENE.



DACCA INSCRIPTION OF LAKṢMAṆASENA.

THE YEAR 3.

36. On Two-Shouldered Stone Implements from Assam.

By Hem Chandra Das-Gupta.

In the collection of prehistoric antiquities of the Indian Museum, there are two stone implements which attracted my notice on account of their peculiar shape. It is proposed to describe them in this short note.

Both these implements were obtained in Assam. One of them (No. 6103) is of considerable interest as it is included in the collection presented to the Indian Museum by Lord Curzon during his viceroyalty in India. These implements were presented to Lord Curzon by Mr. Penny, a tea-planter of Bishnath, and were all obtained in course of digging a ditch on his estate at Bishnath (Tezpur). The second specimen (No. 6114) was obtained from Konarpara in Cachar.

Both the adzes, as the accompanying plate shows, are of the shouldered type and of small size. The chisel-end of one (6114) is very marked and though one of the shoulders is practically gone, the other is fairly preserved and gives an idea of the peculiarity of the type. An examination of the specimen also shows that only one surface has been ground down to produce the cutting edge. The other (6103) also appears to be crudely fashioned like a chisel and the shoulder is not so prominent as in the previous one. Both the specimens are much weathered. The specimen No. 6114 has been fashioned out of arenaceous clay while slate was utilized to produce implement No. 6103. The specimen No. 6103 is a little larger than the specimen No. 6114. The shapes of these two implements at once recall those of the peculiar Burmese type so fully described by the late Mr. Theobald,[1] and a comparison with his specimens and figures leaves no doubt as to the marked similarity between those obtained from Burma and the two specimens obtained from Assam.

After the publication of Theobald's paper the late Mr. Ball described two adzes of the Burmese type,[2] found in Dhalbhum (Singbhum),—the similarity of which was very striking. Ball was uncertain of the origin of the implements, i.e., whether they were indigenous or imported,—though there was nothing in the petrology of the rocks used in their manufacture to dissuade one from believing in their being of local make.

In an interesting communication to the Asiatic Society of

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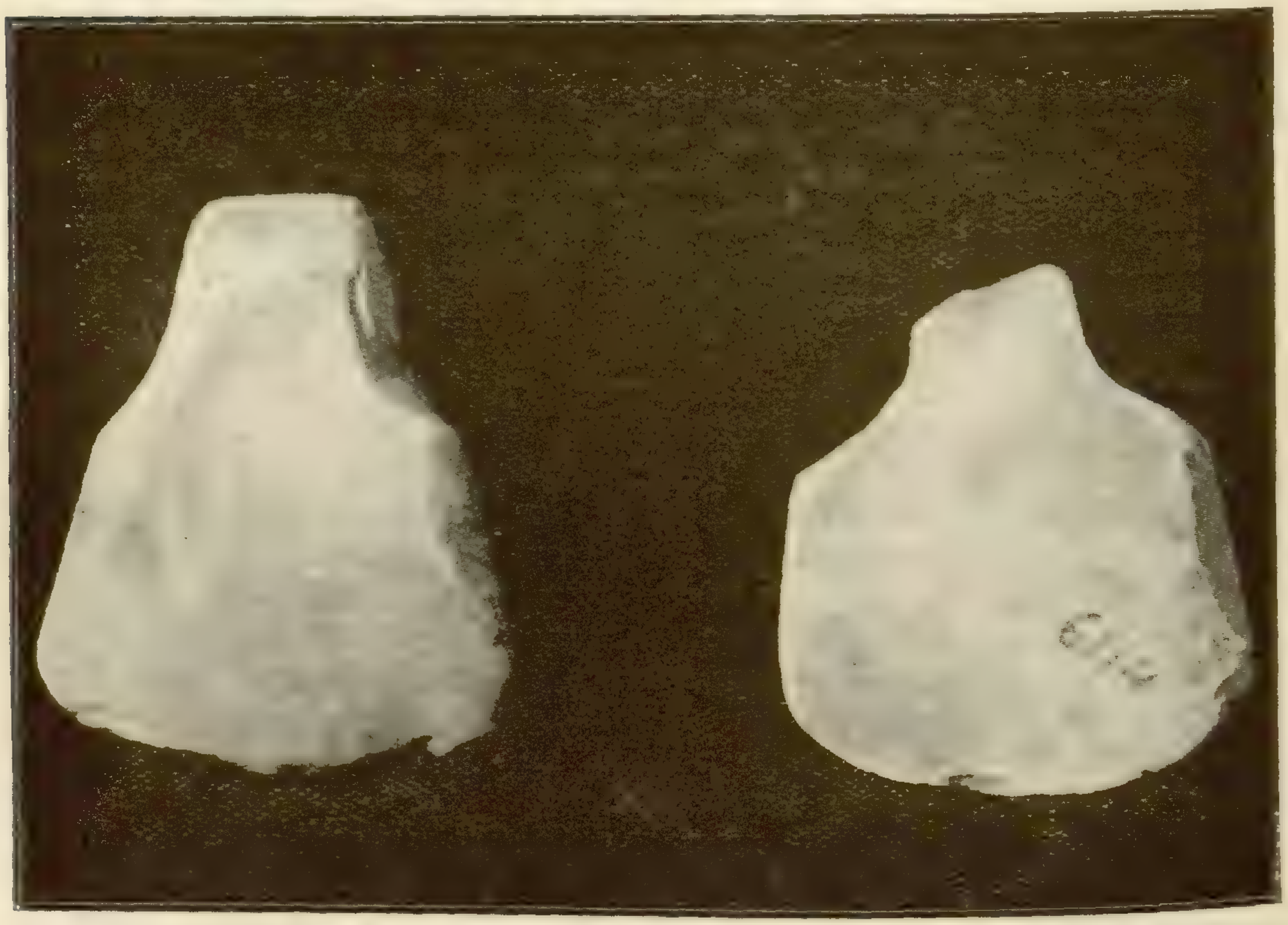
[1] *Mem. Geol. Surv. Ind.*, Vol. X, pt. 2, pp. 167–171.
[2] *Proc. As. Soc. Bengal*, 1875, pp. 118–122.

Bengal dealing with the history of Pegu,[1] Major-General Sir Arthur Phayre pointed out that there was a remarkable similarity between the language of the Mun (otherwise known as Mon or Talaing) of Pegu and that of the Munda of Chutia Nagpur,[2] and almost immediately after the publication of Mr. Ball's paper Sir Arthur Phayre pointed out that his (Mr. Ball's) find only corroborated the argument derived from linguistic considerations.[3]



As remarked before, the specimen (No. 6114) is of arenaceous clay while the specimen No. 6103 is of slate. Implement No. 6114 was found in Cachar. A very short account of the Geology of the North Cachar hills has been published by Mr. LaTouche,[4] and considering that Konarpara, the find-spot of specimen No. 6114, is situated at the foot of the Tertiary hills,

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[1] *Jour. As. Soc. Bengal*, Vol. XLII, pt. 1, pp. 23–57 and pp. 120–159.

[2] *Op. Cit.*, p. 35.

[3] *Proc. As. Soc. Bengal*, 1876, p. 3. There appears to be a little confusion in Sir Arthur Phayre's use of the word Kol. He uses the terms Munda and Kol as synonymous, but the word Kol is used to include the Munda, Ho and Oraon tribes, and though the Munda and the Ho are much akin to each other the Oraons are quite distinct from both of them.

[4] *Records, Geol. Surv. Ind.*, Vol. XVI, pt. 4, pp. 202–203.

we can reasonably suppose that the implement was of local manufacture.

Specimen No. 6103 has been obtained from Bishnath situated on the alluvium of the Brahmaputra. The Mikir hills lie close to this place, and for a short geological note on these we are indebted to Mr. Smith.[1] An examination of his map, however, shows that the part of the hills lying close to the alluvial region is practically unknown geologically, and though the comparison of this and the associated implements with Mr. Smith's specimens, as stored in the Indian Museum, did not throw any light on the matter, there is no inherent improbability of Mr. Penny's specimens being local, i.e. derived from Assam and possibly from the Mikir hills. In a short manuscript note about the specimens obtained by Mr. Penny, Mr. Vredenburg suggested that the rock-material of the implements was derived from the Archaean, Transition and Tertiary series as also from the Khasia and the Sylhet trap. It is worthy of note, in this connection, that highly decomposed trap was also found in the part of the Mikir hills examined, and according to Mr. Smith, is nearly related to that discovered by Mr. Medlicott in Sylhet.[2]

It has been noted before that the discovery of the peculiar Burmese type of implements in Singhbhum led to the formation of theories regarding the connection between the Mon race of Burma and the Mundas of Chutia Nagpur. The occurrence of these two implements of the Burmese type, in areas through which the wave of Khasia immigration very likely passed, before the race found its present hilly home, is of extreme interest and is quite in conformity with the view so long held regarding a relationship between the Khasias of Assam and some of the older tribes of Burma, which has been based chiefly on linguistic grounds.

In conclusion, I take this opportunity of thanking my friend Mr. Rakhal Das Banerji, M.A., Assistant Superintendent of the Archaeological Department, through whose courtesy I had an access to these specimens, and also Mr. J. Coggin Brown for some useful suggestions while drawing up this note.

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1 *Mem. Geol. Surv. Ind.*, Vol. XXVIII, pp. 71–95.
2 *Op. Cit.*, p. 80.

37. The Life and Works of Muḥibb Allah of Bihār.

By Mawlavi M. Hidayat Husain, *Lecturer, Presidency College, Calcutta.*

It is a fact known to almost all students of Arabic literature that the Persians have played a great part in enriching that literature. Almost every standard work on various branches of learning is the outcome of their labour.

The Indians too have tried their best to write books in the Arabic language, and some of them wrote such learned works that they surpassed even the Persians. Among them may be mentioned the name of Muḥibb Allah of Bihar. His work *Musallam al-Ṣubūt* is unique of its kind and is not only taught all over India but was held in such high esteem by the Arabs that the authorities of the al-Azhar University had to include it among its final courses of study. A short life of this scholar, I am sure, will be of some interest to the orientalists of India and abroad. His full name was Muḥibb Allah B. 'Abd al-Shukūr al-Ḳāḍī al-Bihārī. He was born in Karah, a village in Bihār, India. He sat at the feet of Mawlānā Ḳuṭb al-Dīn al-Shamsābādī (d. A.H. 1121, A.D. 1709), and became one of the most eminent Ulama of his time. He paid a visit to the Emperor 'Ālamgīr (A.H. 1069–1119, A.D. 1659–1707) when the latter was in the Deccan, which resulted in his being appointed to be Ḳāḍī (judge) of Lucknow. After some time he was transferred to Hyderabad, Deccan, where he held the same appointment; but unfortunately the Emperor became displeased with him and he had to resign the service. However, through the recommendation of some of the nobles of 'Ālamgīr's Court, the Emperor pardoned him and conferred on him the tutorship of his grandson Rafī'al-Ḳadr, son of Muḥammad Mu'aẓẓam. When the latter was appointed to the governorship of Kābul, both tutor and pupil accompanied him to the capital of Afghānistān.

On the death of the Emperor 'Ālamgīr, Muḥammad Mu'aẓẓam became the sovereign of India under the title of Shāh 'Ālam I (A.H. 1119–1124, A.D. 1707–1712), and bestowed upon Muḥibb Allah the title of "Fāḍil Khān" and made him Ḳāḍī al-Ḳuḍāt (chief justice) of the entire Moghul Empire; but he did not live long to enjoy this title, and the great post, as he died a few months after in A.H. 1119, A.D. 1707.

He is the author of the following works:—

(1) *al Jawhar al-Fard.*—A treatise on indivisible atom

Ferangi Mahal Library, Lucknow, f. 23; Loth, Ind. Off., No. 581 IX.

(2) *Musallam al-Ṣubūt.*—A treatise on the principles of Muhammadan jurisprudence according to the Ḥanafī school, Rampur Library, p. 278; Ferangi Mahal Library, Lucknow, f. 118; Bankipur Library, p. 716; Asiatic Society of Bengal (List of Arabic Books), p. 23; Niẓām's Library, Hyderabad (Fann-i Uṣūl Fiḳh), p. 4. Printed in Aligarh A.H. 1297 (1879), and in Dehli A.H. 1311 (1893).

Several commentaries are in existence on this work:—

I. By Mullā Niẓām al-Dīn B. Ḳuṭb al-Dīn al-Sahālawī (d. A.H. 1161, A.D. 1748), Rampur Library, p. 174; Ferangi Mahal Library, f. 117; Loth, Ind. Off., 332.

II. By Mullā Mubīn B. Mullā Muḥibb Allah al-Lucknawī (d. A.H. 1225, A.D. 1810), Rampur Library, p. 274.

III. By Baḥr al-'Ulūm 'Abd al-'Alī Muḥammad B. Niẓām al-dīn al-Sahālawī (d. A.H. 1125, A.D. 1713) entitled *Fawā'iḥ al-Raḥmūt*; Ferangi Mahal Library, f. 117; Niẓām's Library (Fann-i-Uṣūl Fiḳh), p. 6; lithographed, Lucknow, A.D. 1878.

IV. By Mullā Ḥasan B. al-Ḳādī Ghulām Muṣṭafā, Rampur Library, p. 275; Niẓām's Library, Hyderabad (Fann-i-Uṣūl Fiḳh), p. 4.

V. Mawlānā 'Abd al-Ḥaḳ B. Mawlānā Faḍl Ḥaḳ al-Khairābādī (d. A.H. 1317, A.D. 1899), Rampur Library, p. 275; lithographed, Cawnpore.

VI. By Muḥammad Bashīr al-Dīn, entitled *Kashf al-Mubham*; lithographed, Cawnpore, A.H. 1287 (A.D. 1870).

(3) *Sullam al-'Ulūm.*—A treatise on logic, Rampur Library, p. 451; Ferangi Mahal Library, Lucknow, f. 24; Bankipur Library, p. 354; Loth, Ind. Off., 563; lithographed, Lucknow, A.H. 1265 (A.D. 1848).

As the work forms part of a course in Arabic at the Indian Universities, many commentaries and supercommentaries and glosses have been written on the book.

Some of the commentaries are here quoted:—

I. By Ḥamd Allah B. Shukr Allah (d. A.H. 1160, A.D. 1747), Rampur Library, p. 454; Ferangi Mahal Library, f. 23; lithographed, Lucknow, A.H. 1264; Cawnpur, A.H. 1264 and A.H. 1278.

Supercommentaries on the above:—

(*a*) By Sharīf Khān B. Muḥammad Akmal Khān (d. A.H. 1231, A.D. 1815), Rampur Library, p. 439.

(*b*) By Muftī Sa'd Allah al-Murādābādī (d. A.H. 1294, A.D. 1877), Rampur Library, p. 439.

(*c*) Turāb'Alī B. Shujā'at 'Alī al-Lucknawī (d. A.H. 1281, A.D. 1864), Rampur Library, p. 439; Ferangi Mahal Library, f. 23.

(*d*) Asad Allah Panjābī, Rampur Library, p. 440; Bankipur Library, p. 418.

(*e*) Ghulām Yaḥyā B. Najm al-Dīn (d. A.H. 1128, A.D. 1715), Rampur Library, p. 439; Ferangi Mahal Library, f. 23.

(*f*) Imād al-Dīn al-Uṣmānī, Rampur Library, p. 440.

(*g*) Muhammad 'Ālam, Ferangi Mahal Library, f. 23.

(*h*) Barkat Allah, Ferangi Mahal Library, f. 23.

(*i*) al-Saiyid Muḥammad al-Mujtahid al-Shī'ī, Ferangi Mahal Library, Lucknow, f. 23.

(*j*) 'Abd al-Ḥaḳ B. Faḍl Ḥaḳ al-Khairābādī (d. A.H. 1317, A.D. 1899), printed, Lahore.

(*k*) Ilāhī Bakhsh al-Faiḍābādī, lithographed, Cawnpur, A.H. 1278.

(*l*) Muftī 'Abd Allah Taunkī, lithographed, Lahore, A.H. 1309 (A.D. 1892).

(*m*) 'Abd al-Ḥalīm B. Amīn Allah al-Lucknawī (d. A.H. 1285, A.D. 1868) under the title of *Kashf al-Ishtibāh*, Rampur Library, p. 461; lithographed, Lucknow, A.H. 1284.

II. By Mullā Ḥasan B. Ḳāḍī Ghulām Muṣṭafā, Rampur Library, p. 453; Ferangi Mahal Library, f. 22; lithographed, Lucknow, 1870.

Supercommentaries:—

(*a*) Tūrab 'Alī B. Shujā'at 'Alī (d. A.H. 1281, A.D. 1864), Ferangi Mahal Library, f. 23.

(*b*) Muḥammad 'Abd al-Ḥakīm B. Amīn Allah al-Lucknawī (d. A.H. 1285, A.D. 1868), Ferangi Mahal Library, f. 23; lithographed, Lucknow, 1870.

III. By Ḳāḍī Mubārak B. Muḥammad Dā'im Gūpāmū'ī al-Fārūḳī (d. A.H. 1162, A.D. 1748), Rampur Library, p. 455; Ferangi Mahal Library, f. 22; Loth, Ind. Off., 567; lithographed, Lucknow, A.H. 1265 (A.D. 1848).

Supercommentaries:—

(*a*) By Mawlānā Faḍl Ḥaḳ B. Mawlānā Faḍl Imām al-Khairābādī (d. A.H. 1274, A.D. 1857), Rampur Library, p. 440; Ferangi Mahal Library, f. 22; Bankipur Library, p. 181; lithographed, Dehli, A.H. 1317 (A.D. 1899).

(*b*) By Muḥammad Aḥsan B. Muḥammad Ṣādiḳ, known as Ḥāfiẓ Darāz Pisẖāwarī (d. A.H. 1263, A.D. 1846), Rampur Library, p. 400; Ferangi Mahal Library, f. 22.

(*c*) By ʻAbd al-Ḥakīm B. ʻAbd al-Rabb (d. A.H. 1288, A.D. 1871), Rampur Library, p. 441.

(*d*) By Nūr al-Islām, Rampur Library, p. 441.

(*e*) By Muftī Muḥammad Yūsuf, B Muḥammad Aṣgẖar (d. A.H. 1286, A.D. 1869), Ferangi Mahal Library, f. 22.

(*f*) By Saʻd Allah al-Ḳandhārī, entitled *al-Ḥawāshī al-Kāshifa*, lithographed, Dehli, A.H. 1300 (A.D. 1883).

IV. By Muḥammad Mubīn B. Muḥibb Allah al-Lucknawi (d. A.H. 1225, A.D. 1810), entitled *Mirʻat al-Shurūḥ*, Rampur Library, p. 456; Ferangi Mahal Library, f. 23; lithographed, Lucknow, A.H. 1266.

V. By Muḥammad ʻAlī al-Mubārakī al-Jawnpūrī, entitled *Miʻrāj al-Fuhūm*, Rampur Library, p. 456.

VI. By Aḥmad ʻAlī B. Fatḥ Allah al-Ḥusainī al-Sandīlī (d. A.H. 1200, A.D. 1785), Rampur Library, p. 456.

VII. By Muḥammad Walī B. Ghulām Muṣṭafa al-Sahālawī, composed A.H. 1155, A.D. 1742; Rampur Library, p. 456.

VIII. By ʻAbd Allah Muḥammad al-Sahāranpūrī, Rampur Library, p. 456.

IX. By Muftī Sharf al-Dīn Rāmpūrī, Rampur Library, p. 457.

X. Baḥr al-ʻUlum ʻAbd al-ʻAlī B. Niẓām al-Dīn al-Sahālawī (d. A.H. 1225, A.D. 1713), Bankipur Library, p. 396; Ferangi Mahal Library, f. 23; lithographed, Dehli, 1891.

XI. By Muḥammad Fīrūz B. Muḥabbat, Rampur Library, p. 456; Bankipur Library, p. 419.

XII. By Mullā Ashraf, composed in A.H. 1150, A.D. 1737, Bankipur Library, p. 418.

XIII. By Mawlānā Musāfir, composed in A.H. 1177, A.D. 1763, Bankipur Library, p. 397.

XIV. By Muḥammad ʻAẓīm Pisẖawarī (d. A.H. 1275, A.D. 1859), Loth, Ind. Off., 571.

XV. By Muḥammad ʻAlī Jawnpūrī, Loth, Ind. Off., 572.

Bibliography :—Āzād al-Bilgirāmī, *Subḥat al-Marjān*, p. 76; Ṣiddīḳ Ḥasan, *Itḥāf al-Nubalā*, p. 905; Faḳīr Muḥammad al-Lāhūrī, *Ḥadā'iḳ al-Ḥanafīya*, p. 431; Brockelmann, *Gescht. d. Arab. Litter* II, p. 420, and *The Encyclopaedia of Islam*, Vol. I p. 717.

38. Psychology of Indian Music.

By Alfred Westharp (*Mus. Doc.*).

What does the European know of Oriental music? What does the Englishman, who enjoys the hospitality of India, know of Indian music? The Englishman in India as as well the average European (and I do not mean only the musical amateur but also those Europeans who treat of Oriental music in writing) all hold Oriental, and especially Indian, music to be a kind of noise produced sometimes by harsh voices and sometimes by a still harsher flute, accompanied by the low brumming sound of the native drum.

As Europeans from lack of opportunity have little or no experience of Oriental music, which is very often sacred in character and confined to temples, from which not only Europeans but all unbelievers are rigidly excluded, they have got the impression that all Oriental music is a confused medley of sound and only very few authorities on the subject dared protest against this misconception. Is it not a most remarkable fact that Europe which, at least so far as it is not controlled by commercialism, displays greater energy than ever did an Oriental country in probing problems of this description, has not yet, so to speak, entered the antechamber of the musical soul of the East.

One is compelled to ask, how it is that Europe has up till now remained not only cold but hostile to the subject? I will endeavour to explain this most complex question in a few words. It is because music is the most intimate expression of the inner life of the people who produce it, and because the principles of the inner life of Europe are totally opposed and contradictory to the principles of the inner life of the East. Europe has borrowed the principle of its inner life from the East and calls it Christianity. Christianity, like all the productions of the East, is contradictory to the youthful activity of the nations of Europe. There is in the East no other religion so contradictory to Europe's all-embracing joy of effort and conquest as Christianity, but, *les extremes se touchent*, and for this reason, Christianity became the moral principle of Europe.

Christianity, the most negative religion of the world, the product of the Hebrew race, whose negative aspirations come next to Christianity, dominates the most positive nations of the world—Europe. It goes without saying that the positive spirit of Europe became over-excited through this permanent con-

tradiction ; the desire of conquest, perverted according to the peaceful character of Christianity, became commercialism. If once war killed the bodies of men, now commercialism does its best to kill their souls ; in this sense an English Bishop has himself proclaimed, "If feudalism was bad, plutocracy is infinitely worse because of its powers of corruption." There is no doubt that in a near future in Europe a new and tremendous war will kill thousands of commercial enterprises with their authors in order to clean again the moral conceptions of Europe and to prove that the Eastern creator of the European religion never intended to produce such horrid exaggerations of self-abandonment to things and objective laws. Did not Christ himself pronounce the Divine sentence : "What shall it profit a man if he gain the whole world and lose his own soul?"

The East, on the other hand, has sometimes fallen into the opposite fault : instead off obeying, as Europe does, too exclusively external laws, the East, sometimes, perhaps has followed too deeply the aspirations of its idealism. And more than every other part of the East, India, holy India, has fallen into this admirable fault of exaggerated idealism. This is why the most European Europe more nearly approaches India than the subtle emotions of the different races of India approach each other. India will never be India until she finds a way from her exaggerated idealism to an idealistic realism. The German poet Fredrich Schiller too was convinced that sane "idealism is the true realism."

The present state of music in Europe and in the East, this state which is the cause of the beforementioned lack of musical understanding between East and West, is the following : Europe, which, in its whole moral life, subordinates, as we have seen, her soul to external duties, subordinates her music to the laws of sounds, sounds, as sounds, being as exterior to the musical soul, as all that surrounds us is exterior to what *is* (or what *ought* to be) *in* us. What does that mean ? The music of Europe follows the laws of sounds, of physics and acoustics and of physiology, and is not psychological. The basis itself of the actual European music, the equal temperament which regulates the intervals of our piano, is not psychological.[1] Every sound you play on the standard instrument of to-day's Europe, the piano, is, from the point of view of feeling, —*false*. Not only false, but essentially unemotional because lacking variety.

Oriental music, on the contrary, even the theory of Oriental music, even that of Indian music which is more formalistic than the theory of China and Japan, has no other laws for the production of its sounds and melodies (called "Ragas" in India) than the artist's will. Here you have the musical

[1] See for further details the "Psychology of Sounds," of the German Professor Carl Stumpf.

representation of European materialism and of Oriental idealism, and the reason why Oriental music appears to most Europeans as a mere noise! The European makes music in order to please his ear. The Oriental plays or sings in order to express emotions for which there are no words and no gestures, no designs and no colours. The ear and sonorousness, in Oriental music, are not the aim, as in European music, but the means. This is why the Oriental does not mind producing sounds which shatter the nerves and offend the ear, not only those of an European but even his own. Oriental music begins at a point where Europe believes that there is no more music possible, that there remains but a mere "noise." Not only the sound production, but also the technique of all Oriental instruments, the technique of instrumental playing as well as that of instrumental building in the East, is based upon the same musical principle: Freedom of will and culture of what is most difficult to grasp, because it is the most elusive, and the most volatile thing in the world, the human soul.

Musical folklore is the only means of inner culture which even the poor possess, therefore there is music everywhere in the East, as so many globetrotters report with such a sincere regret in their arrogant and ignorant reports; therefore the Educational Council of the Chinese Embassy in London could write to me last year: "Music in China is everywhere; consequently there are in China to-day no special musicians and no special music schools." Better, indeed, no music school at all in the East than a European music school there. In no other manifestation of life are the famous words of the Sultan Abdul Hamid, "For us the civilisation of the Occident is deadly poison," more undeniable than in music. But China is going to have music schools which will, with God's help, develop the cult of the soul in a conscious culture of the soul through music. And India, where Prattva Devi, Satyabala Devi and Pandit Kishna Degambar are already at work, and which musically has found a sympathetic audience even in London, thanks to Ratan Devi, to Mrs. Maud Mann, this India, I say, will have more and more music schools and more and more schools which consider the world and human duties from an Oriental rather than from the average European point of view.

Now we have to proceed from Indian musical folklore to Indian artistic music. We shall again employ European artistic music which we know, as a means of understanding Indian artistic music which we know less. We have spoken of the laws of acoustics, to which every sound of the present days' European music, in so far (and that is very far) as it employs the piano, is subjected. These acoustic laws are termed laws of "concord"; that is, every sound of European artistic music is intentionally abandoned to laws which have nothing whatever

to do with the artist's will. It is true the greatness of a composer consists also in Europe in that he finds new combinations of sound; but every great composer, who does so, acts against the laws of European artistic music; Beethoven, who naturally could not refrain from expressing his own will, has been called by the musical authorities of his time a musical "pig." And the more a composer dares to evade the laws of acoustics, the more do the musical authorities endeavour to resist him. I need not remind you of the musical history of Europe: it will suffice to mention, for instance, the works of Monteverdi, or Gluck, or Debussy.

There is nothing of all that acoustic unmusicality in India. The Indian theory of sound relation is the before-mentioned theory of "Ragas." The ragas are melodies which have no harmonic obligation whatever. They are melodies expressing feeling freely and frankly. It is true that the composers of India are in a certain sense officially bound to keep to the traditional ragas as European composers are bound to keep to concord; but firstly the creation of new ragas is not at all entirely objected to; and then, secondly—and this is a point which is of the highest importance and which consequently seems to have been overlooked by all, I say without exception *all*—the European authors treating of Indian music: the essence of Indian musical theory is not the raga, but the improvisation. I have tried to explain this unheard-of monstrosity, but an essential law of Indian musical theory considered from the European point of view, in my study, "The Eastern Origins of Music." From this I will quote only a phrase: "Improvisation is included in the system itself of Indian music." A freedom, which has never been permitted, which has never even been taken into consideration in European music, and which now, so to speak, exists no longer in Europe, that freedom, called improvisation, is the foundation of Indian artistic musical theory. Will new Europe—that Euorpe which tries to get rid as well of Christianity as of commercialism—will that new Europe ever realize the magnanimity of this artistic fact and the depth of the psychic refinement which underlies it?

The second fundamental law of Indian artistic musical theory is called the law of "tala." This corresponds to the accent which is supposed to exist upon the first and occasionally also upon the third part of the European bar. This accent of the bar is actually disappearing, and European music of to-day has, so to speak, no longer any variety of intensity. The accent of the barred measure was its last remnant. Instead of pointing out the predominance of certain sounds of the melody through intensive marks, European music actually measures the value of sounds only by measuring the "time" during which the sounds last. European musical theory measures the *time* which has nothing to do with the sounds them-

selves, which is as exterior to the sound as acoustics, instead of measuring the intensive value of these sounds. This is the second psychological sin European musical theory nowadays commits. The Indian theory of tala emphasises just this intensive value of sounds, which the Europe of to-day neglects officially more than it ever did before. And what is the psychic meaning of intensity in music? Not only in music, but in all psychic life, it is changing intensity which produces a changing quality of sensations. Consult on the subject of this *general* psychological law the works of scientists of first rank, such as Exner, Sigwart and others; in exact science Europe is ahead of the rest of the world and it is this exact European science which provided me with the means of proving the high, the incomparable inner value of Eastern music. Musically speaking, it is the intensity of each sound which is the "raison d'etre", the mother (so to speak) of each sound. And changing intensity is the reason of changing pitch of sounds. There is psychologically no feeling in music possible without the cult of intensity, which present-day Europe so entirely neglects. This statement is far from being an invention of my own, it is the English philosopher Hobbes who says: "To always feel the same and not to feel at all comes to the same thing."

Here you have the psychological reason of the "tala." Tala is a means of causing each sound, which is, as we have seen, originated by the free will of the musician, to satisfy by changing degrees of intensity all the demands of his musical soul and to enter the musical soul of the listener. It is true that the Indian tala is in so far related to European barred measure, as the series of rhythms which the "tala" produce themselves; and this is a point which will have to be revised by new India. In any case, even in its present condition the tala is much more expressive than the accents of the European barred measure, which so to speak have ceased to exist in European artistic music and consequently do not contribute much to the inner life of the sounds. The tala is much longer and much richer in shadings.

The East derives all kind of benefit from the West as far as commercial and technical improvements are concerned. Why should the West not derive on its part benefit from the East in matters of psychology and of art? Do not all the most advanced Europeans agree upon the artistic superiority of the East? The Italian Raphael Petrucci preaches on Chinese painting; the Russian Zolvubew believes above all in Persian miniatures; the Frenchman Louis Lalvy has Chinese interests, and Pierre Loti's heroism in favour of Turkey is in your memory, and a certain Englishman, named William Jones (Sir William Jones), the founder of the Asiatic Society of Bengal, himself said in a speech before this Society: "The

"Hindoo system of music has, I believe, been formed on "truer principles than our own; and all the skill of the native "composers is directed to the great subject of their art, the "natural expression of strong passions, to which melody (in "the European sense) indeed is often sacrificed." Why should the England of to-day not follow the steps of Sir William Jones and undertake the study of Indian music?

English national music would undeniably profit by this study, as I explained already in my study "The Musical Soul of Folksong"; because England has no national music but its folk-music, and Eastern musical systems are much more useful for the study of folk-music than the modern European system. In any case India needs nothing more than the logical development of her immeasurable natural gifts. And who will deny that England's future in India depends very much on England's understanding of Indian psychology.

39. Nor'westers and Monsoon Prediction.

By E. Digby.

Introduction.

These few remarks are set out to suggest a correlation between the leading characteristics of the nor'westers occurring during the hot weather transition periods and the following monsoon, together with a discussion of the probable formation of these interesting minor storms. The paper is intended to be suggestive only since the author has unfortunately collected insufficient data to establish the theory or frame anything more than tentative rules of forecasting. The latter would probably need the experience of some fifteen or twenty years before anything of value could be deduced.

The history of monsoon prediction in India has been a chronicle of the continual widening of the area of enquiry and observation. Deductions obtained from the preceding winter's snowfall in the hills, and the barometric fluctuations in Ceylon proved capricious and unreliable and nowadays the forecast is a balancing of conclusions drawn from Abyssinia, South America, Australia and the remoter Indian Ocean. A forecast based upon so many, often conflicting, variables cannot hope to be completely satisfactory, though the Meteorological Department may congratulate itself upon the near approach to success with which the annual problem is attacked.

One of the main difficulties of the situation is the lack of well-marked air disturbances of any great duration during the six months before the rains. In Bengal the date of the reversal of the lower air-currents from north to south and the commencement of the hot weather is about the only well-marked phenomenon from which deductions can be drawn. There are no large cyclonic storms and the investigation of the upper air-currents has up to now, for lack of sufficient money and trained observers, been insufficiently extensive to prove of use. In order to obtain well-marked phenomena meteorological research has had to travel extensively round the southern hemisphere.

There is, however, one series of events in India itself which has been overlooked by investigators in search of clues to gauge the probable nature of the coming monsoon. And that has been the nor'westers. Owing to their limited area and feeble influence upon general weather conditions these small storms have had singularly little attention paid to them. One monograph written by Sir John Eliot in 1876, and certain

observations contained in his papers on anemographical records published in 1910, seem to represent the entire literature on the subject. An interesting project to investigate them more thoroughly appears to have been discussed several years ago, but it fell through upon, I believe, the death of the scientist who made the proposal. Sir John Eliot's papers contain a wealth of statistical detail with respect to accompanying barometric and wind changes. But there is practically no discussion of the structure of these storms and actually none at all as to the area, storm-face or length of path. Meteorologists have been content to describe them as whirls formed, under certain specified conditions of the barometric gradient, at the intersection of the wind streams down the Ganges and Brahmaputra valleys. And there the matter has been left

To the observer, however, who is interested in watching these brief storms, two features will gradually attract attention. The first is that a storm on one night will very often be followed in the two succeeding evenings by similar but much feebler disturbances, showing that the large displacements of air and the shifting of temperatures have not altogether obliterated certain fundamental conditions which gave the storm its particular appearance. The second feature is that during one year the storms of the season will show certain definite characteristics, while those of the following year will exhibit a similar family resemblance to one another in the same year but not to those in the preceding year. One year will produce a series of the typically complete nor'wester with its double line of clouds and the lightning occurring after the heavy rain cloud has arrived, while another year—such as the present—will show heavy lightning for some time before the wind-storm has arrived.

From this annual grouping of storm types there arises at once the probability that careful investigation may show a direct relation between the nor'wester type and the character of the following monsoon.

It is obvious that the cloud form in a nor'wester is due to two main sets of influences—the alterations in pressure gradients in surrounding territory and the nature of the upper air-currents into which it penetrates. Its form can be seen: the pressure gradients are registered by the Meteorological Department. Careful study should therefore enable us to make valuable deduction concerning the upper air-current, which forms the third factor in the problem. Actually we have in the nor'wester at no cost to ourselves a weather gauge, with a base, possibly, of twenty square miles and a height of some five or six, thrust into the upper air to indicate its condition, its humidity and its wind directions. The indications of this weather gauge will be difficult at first to disentangle. But when disentangled they should throw light upon much that is germane to the forecast of the monsoon. The very

smallness of area of the nor'wester is an advantage from this point of view. In larger storms the cloud changes are slower and more widely diffused. Here they are rapid and concentrated. One observer can therefore do the work that would otherwise require a dozen scattered over a prolonged storm area.

The proving or disproving of the theory tentatively suggested here is therefore a matter requiring small expense and little organization. It requires a single interested observer who registers what he sees and is sufficiently patient to extend his observation over an adequate number of years.

Sir J. Eliot's Researches.

As regards the barometric and wind changes, Sir John Eliot in his paper of 1876 shows that the conditions under which nor'westers occur are an increase in the relative pressure over the middle of the Bay, with its consequent of a diffused shallow low pressure over the Delta. This he conceives as causing a strong moisture current of considerable depth from the south-west across the Bay towards the Arracan coast. This current checks the flow of the upper northerly current across Bengal, and before the moist current can be deflected into the depression in Bengal a down-rush of cold air from the upper northerly current takes place in the Delta causing the nor'westers. With the modification that the increase in pressure in the Bay is probably due to the south-west current and not vice versa, this may be accepted provisionally. He then goes on to show from meteorological statistics that the distinguishing feature of these storms is an actual rise in the barometer as they approach. Then, coincident with the greatest rise of the barometer, the temperature suddenly falls by ten degrees or more, the aqueous tension decreases very rapidly and the wind reverses its direction from the south-east to the north-west. Afterwards there follows rain which may be small or large in amount. He ascribes these changes to the sudden displacement vertically downwards of a large body of air due to diminished pressure. In the words of modern aeronauts the storm is caused by the vertical filling up of a large "hole" in the air.

In his later paper on "Anemographic observations recorded at Saugor Island from March 1880 to February 1904" (published in 1905), Sir John Eliot appears to connect the storms more closely with the normal hot weather depression which stretches from West Bengal through Chota Nagpur to Upper Sind or the North-West Punjab. The three air currents—from the Bay and down the Ganges and Brahmaputra valleys—create a feeble cyclonic movement, and when the shallow depression shifts towards north Bengal the Bay winds recurve to pass up the

Gangetic plain, and this emphasizing of the cyclonic movement gives rise to "thunderstorms" over the whole of Bengal. Nor'westers, he records, occasionally pass seawards, but die out not far from land and are therefore only occasionally felt on Saugor Island itself.

The Typical Nor'wester.

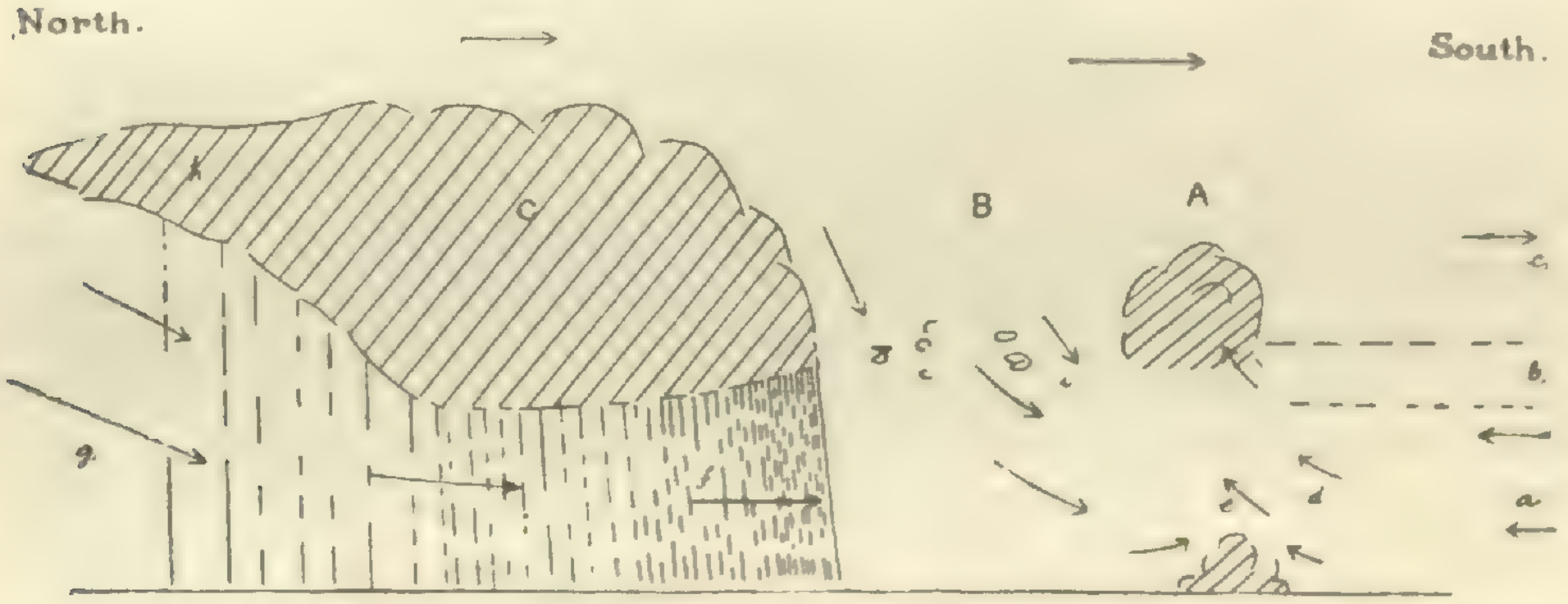
In the preceding section I have dealt with already recorded facts and theories. It is necessary now to consider more intimately the individual structure of the nor'wester. Its distinctive features are its rapidity of approach and the rapid transverse motion of the clouds in addition to the forward movement. The storm, in its most typical form, is first seen as a big bank of vapour on the north-western horizon. Its thundery nature is shown by the fact that the breeze is blowing briskly towards it from the south and south-east. As the cloud comes nearer it is seen that in addition to the centre core of cloud moving towards the spectator there is a bank of somewhat lower cloud also moving forward but having in addition a very rapid transverse motion from west to east, or the same direction in which the winds revolve in the big cyclonic storm systems. Just before this cloud arrives overhead the southerly wind dies away to a calm and the temperature appears to rise. But this may be only the effect of the dying away of the wind. I have not tested the matter. Under the first of the transverse waves of cloud the temperature rapidly falls by reason of the springing up of a strong cool north-westerly wind blowing up clouds of dust. There is little rain with this first wave in typical cases. But behind it is a second wave also moving with great rapidity from west to east in addition to its forward progression. As regards the cloud structure between the two waves the clouds thin off very rapidly and instead of the transverse motion of the two waves there is a rotary or churning motion or sometimes even a rapid motion from the south to north towards the second wave. With the second wave comes a temporary increase of the wind which has been continuing to blow from the north-west. But the main feature of the second wave is the heavy rain which begins immediately and continues to fall in torrents until the excess moisture has been disposed of, and the clouds clear up almost completely. As regards the lightning which accompanies the storm, it is associated with all three phases, but is mainly confined to the second wave and the subsequent rainy period.

This then is the typical storm. But by no means all nor'-westers follow it exactly. In many cases there is only one transverse-moving wave. In other cases the cloud does not clear up after an hour or more of rain. The rain continues to fall, but less furiously, and a great deal of lightning takes place

in the cloud canopy, sometimes of an impressive nature. In such cases there is often, but by no means always, a recrudescence of the storm late in the same evening or very early next morning. Nor'westers will sometimes come from other points of the compass, from the north-east and more rarely even from the south, in each case the distinguishing feature being the presence of the wave or waves of cloud moving forward rapidly, but with a rapid transverse motion as well. The transverse movement, also is occasionally from east to west, but in such cases the nor'wester is of very feeble strength.

Its Formation.

In considering the formation of the storm one must account for the wind, temperature and vapour tension noted



A. First storm cloud, moving transversely from W.S.W. to E.N.E. and travelling towards south south-east.
B. Area of descending northerly wind, clear with a few cloud eddies which evaporate in the cold dry air.
C. Main cloud mass, of which the advancing surface has very definite outline owing to great difference in temperature and humidity of the air-currents.
a. Southerly wind from Bay.
b. Still air layer between *a* and *c*.
c. Upper northerly wind.
d. First up-current of lower heated air.
e. Dust storm at ground level at meeting of the two currents.
f. Heavy rain.
g. Upper north-wind deflected downwards to pass under main cloud mass.
h. Lightning usually occurs most plentifully at this stage in the cloud—seldom cloud to earth, which if it occurs takes place at *f*.

by Sir John Eliot, and also for the transverse motion and the curious double layer of advance clouds with a stretch of comparatively clear sky between. My own view is that the storm begins in the first bank of clouds. In any hot country where the ground and lower layer of air is heated to a high temperature by the sun there must always be a condition of veiled instability during the daytime between the light

expanded lower layer, and the cold denser air above. Usually the tendency to large scale vertical currents is checked by a low vertical barometric gradient and by the fact that the air currents of the upper and lower atmosphere are moving fairly rapidly but in opposite directions. Anything, therefore, that would alter the gradient or reduce the speed of the winds should produce some vertical displacement of air.

Adopting Sir John's first theory we get both factors altered in a direction favourable to such a change. The first movement takes place at A in the diagram with a mass of hot air breaking upwards and condensing as a heavy cloud. Meanwhile the cold north wind at B impinging against the upwards movement is deflected downwards. The cloud detritus left by the passage of the cloud over the area previously occupied by it is violently contorted and rapidly absorbed leaving an area of clear sky. Meanwhile the slackening of the velocity of the north wind by its impinging upon the first cloud and being deflected downwards enables a large mass of lower air to escape upwards at C to a great height with the formation of thick cloud, lightning and rain. The north wind at its rear is deflected downwards ensuring a continuance of the cool north wind for some time after the initial down-rush. Below A the meeting of the descending north wind, which is beginning to flatten out, with the south wind, suddenly deflected upwards, produces an aspirating effect which is shown by the dense clouds of dust usually associated with the first cloud.

Not a Cyclone but an oblique Air Slit.

There remains now to consider the transverse movement of the clouds The vapour in the first cloud bank is moving from the SSE usually. It forces its way up into a northerly air-current. Being a comparatively narrow bank it rapidly acquires the new velocity added to its own and their component is roughly eastward.

If this proves ultimately to be the correct explanation of the transverse motion two important corollaries follow. In the first place it is evident that this motion is not an evidence of any cyclonic motion and the storm we see is not a mild typhoon, circular in motion, but it is a non-circular replacement of one layer of air by another. If there is any eddy it is derivative and not a normal product of storm. This lack of eddy effect explains the absence of hail in the usual nor'wester. A priori one would expect hail. The sudden temperature change, the high wind velocity, the violent cloud commotion, are all apparently favourable symptoms. But it is exceedingly seldom that any hail falls. The absence of a large eddy seems sufficiently to explain this, and in its turn it supports the above theory of the cloud motion.

The second deduction is equally important. This nucleus of the first bank of clouds is carried to the west and with it is carried the upper part of the column of air that feeds it from below. This creates a similar tendency towards an upward movement in the lower air to the west. This is emphasized by the deflection of the cold wind downwards which so increases the pressure on the lower air as to force it upwards. The upward air motion, once having begun, is not simply carried westward and south, but actually creates a similar upthrust on its westerly side. What happens is that the surface—or rather, the layer—of still air separating the lower south wind and the upper north wind is being slit rapidly as the storm travels south-east. Fresh storm material is being formed there during the motion of the storm. It is this which explains the unusually rapid motion of the storm across the sky.

Three motions therefore exist. There is first the general south-easterly movement of the storm mass borne by the north-west upper wind into which it has penetrated. There is next the motion of the clouds in the first bank which travel roughly westward, the movement being compounded of the southerly lower and north-westerly upper winds. And there is, thirdly, the transverse slitting of the boundary layer between the two winds which takes place along a line compounded of the westerly motion of the cloud-bank and the north-westerly upper wind.

If one rids the mind of the idea that the nor'wester is a cyclone and substitutes for it the conception of a slitting of the boundary layer horizontally, but obliquely, to the path of the storm, all the dominant phenomena fall smoothly into their places. Along the slit warm air is intruded upwards and cold air downwards and behind it; the boundary layer no longer existing, a large volume of warm air rises to form the main cloud mass.

Monsoon Prediction.

The ruptures of the boundary layer between the lower Bay currents and the upper air occur sufficiently frequently during the three or four months before the monsoon to afford very valuable data as to the condition of the air. The first bank of the nor'wester is so firm and definite in outline that it should easily afford information of its height. The structure of the bank and of the main cloud will afford evidence of the depth of the boundary layer and the conditions prevailing in the upper current.

Speaking generally one would expect that if the upper northerly current is, on the average, above its normal strength the advance of the monsoon current will be delayed. But if it is above its usual strength it will probably be colder and

dryer than usual; the difference in constitution and character between the lower and upper currents will be more pronounced; and the nor'wester will be more definite in cloud outline and more nearly approaching the type described above. On the other hand, if the upper current be weak, thereby indicating little opposition to the approach of the monsoon, then the clouds will be loose in texture and the transverse motion small. That this may possibly prove correct is shown by the fact that the nor'westers of the present year differed strikingly from the described type, the approach of the first cloud bank being anteceded by a smooth very high layer of grey cloud. On the other hand some few years ago when the monsoon was by no means plentiful almost every nor'wester was of the described type.

In conclusion I would urge that in the nor'wester we have a storm which is worthy of much greater study than it has hitherto received. In a country like India meteorologists, whether official or amateur, are few in number and scattered sparsely over a large country. To these the nor'wester possesses the advantage that it is concentrated in area and its main features can be studied by a single stationary observer, while there is the further advantage that the storm takes place at a time of the day when the observer has usually no business claims upon his time. The main points to be studied may be summed briefly as follows:—

I.

(Investigations for which more than one observer is needed).

(*a*) Length of path of individual storm.
(*b*) Length of storm face.
(*c*) Distribution of simultaneous nor'westers and the distance between them.
(*d*) Velocity of storm travel.
(*e*) Variation of rainfall at different points of its path.
(*f*) Phenomena at commencement of formation of a nor'wester and during its gradual dispersion.

II.

(Investigations which can be conducted by isolated observers).

(*a*) Structure of each nor'wester and variation of structure during the year.
(*b*) Variation of structure from year to year.
(*c*) Correlation between the type-structure of the year and the date of arrival and the rainfall of the monsoon.

40. Notes on the Pollination of Colocasia Antiquorum.

By Maude L. Cleghorn.

(With Plate XVII.)

Colocasia Antiquorum, Schott, is an Arum which grows throughout the greater part of tropical India, and is cultivated on account of its corms which are an important article of diet when boiled. It is known by the name of Taro, Egyptian Arum and Coco, and is called Kachu in Bengali. The plant grows all the year round, but flowers only in the rainy season from July to September. It is a near relation of the familiar English Cuckoo-pint (*Arum maculatum*), and although the flower is not so conspicuous, it is interesting on account of its peculiar device for entrapping insects and compelling them to perform the function of cross-pollination.

The flower or rather inflorescence of the Kachu consists of a spadix which is almost completely enclosed in a long narrow yellow spathe. The spadix is much shorter than the spathe and consists of four distinct parts :—

(i) An upper smooth pointed portion about an inch or two in length which bears no flowers, called the appendage.

(ii) A long and fairly thick cylindrical portion of about two and a half inches in length, consisting of numerous closely packed pale yellow staminate flowers. Each staminate flower consists of about 6 (3-8) sessile anthers which are all united into a single structure (synandrium), and opens at the top by six minute pores. Each pair of minute openings, with the lobes on either side of it, really represent the top of one of the sessile anthers which make up the synandrium.

(iii) A slender middle portion, about an inch long, and corresponding in height to the constricted part of the spathe, composed of a few elongated and irregularly shaped bodies—rudimentary flowers.

(iv) The lowest part of the spadix which is rather thick and about an inch and a half long is enclosed in the lower compartment formed by the spathe. It consists of numerous rounded bodies of a glossy dark green colour, constituting the mass of pistillate flowers. Each pistillate flower consists of three united carpels forming a one-celled ovary and a

sessile slightly three-lobed stigma. Within the ovary are numerous orthotropous ovules arranged on three parietal placentas. Neither the staminate nor pistillate flowers have any perianth.

In the Kachu plant, as in other Arums, the flowers are protogynous, a condition in which the stigmas ripen first. To adapt this condition to the employment of insect agency for the purposes of cross-pollination the inflorescence of the Colocasia passes through three stages. In the first stage the lower dark green part of the spathe partially opens and exposes the mature stigmas of the pistillate flowers, during this period a rather strong and unpleasant odour is observed which has a peculiar attraction for insects, and several flies are usually found during the day alighting near the opening and crawling inside. In the afternoon the scent becomes fainter, and the lower part of the spathe gradually closes, and by the evening the flies are completely imprisoned in the spathe. The spathe is erect, and the narrow portion is not sufficiently constricted to prevent the flies passing into the upper portion. On the following morning the upper part of the spathe will be found to have partly opened, but the lower part remains tightly closed. This is the second stage; the staminate flowers are mature, and the anthers have commenced to shed their pollen, and the upper part of the spathe begins to turn yellow. The flies remain imprisoned until this stage is reached, they feed upon the pollen as soon as it appears, and at night they crawl up into the apex of the spathe and seek shelter from the damp and cold. On the day after, when they have had a surfeit of pollen, they fly through the opening, and visit another inflorescence where the stigmas are exposed and the odour attractive. In the third stage the upper part of the spathe turns yellow, falls away at an obtuse angle from the spadix, exposing the staminate flowers. At the same time the constriction of the spathe is narrowed so as to prevent the pollen falling upon the stigmas of the same plant, and any pollen falling from the anthers collects at this constriction. The lower portion of the spathe remains closed over the pistillate flowers which have been pollinated by the agency of the flies, and the fruit is allowed to form without further disturbance. The flies, which have been revelling in the staminal chamber, become covered all over with fine pollen and fly off to another inflorescence. Here the grains adhere to the sticky stigmas as they crawl over the newly opened flowers, and after divesting themselves of the pollen, crawl into the upper chamber and obtain more pollen when they are again ready to convey it to another plant. In this way cross-pollination of the Kachu is effected.

In the cuckoo-pint the flies and other insects enter from

Fig. 1. First stage.

Fig. 2. Second stage.

Inflorescence of COLOCASIA ANTIQUORUM.

above and passing downwards reach the pistillate flowers, where they are imprisoned until the pollen is ready for disposal. In the Kachu the lower part of the spathe deliberately opens and closes to capture the flies, and again opens above to release them. The floral mechanism of the Kachu differs therefore from that of the cuckoo-pint.

In *Arum maculatum* the primary attraction is the thick, dark-purple end of the spadix which projects out of the spathe at a very early stage, and the subordinate attraction is the decomposing smell of the inflorescence. In the colocasia the primary attraction is the strong and unpleasant odour issuing out of the partially opened spathe in the first stage, and the subordinate attraction, the colour of the appendage and the food for the flies, in the form of pollen.

During the rains when the air is very damp the upper part of the spadix while still attached to the plant commences to decompose, and the flies lay their eggs on it before flying off. If a rather mature spadix, in which the fruits are forming, be examined under a lens, it will be found to be full of the minute maggots of these flies. It seems, therefore, that the life of the flies, which have been identified in the Indian Museum as a species of Acalytrate Muscidae, is closely associated with that of the Kachu for the purposes of cross-pollination.

41. The Date of Aśoka's Coronation.

By Kāshi-Prasād Jāyaswāl, M.A. (*Oxon.*).

The date of the coronation of Aśoka is the safest starting point in the chronology of India before the rise of the Guptas, for the evidence on the point is of the most reliable kind. The hypothetical date for the accession of Chandra-Gupta Maurya[1] which is often taken as the starting date is based more on surmises, and is far less reliable than the date which we can get from the data connected with the coronation year of Aśoka.

As to the date for the latter event there are at present two opinions: according to the one the *abhisheka* took place in 264[2] B.C. and according to the other in 269 B.C.,[3] both assuming 321 B.C. as the year of the accession of Chandra-Gupta Maurya. The difference between the two results partly from a difference of three years as regards the reign-period of Bindusāra (the Purāṇas giving twenty-five years, while the Mahāvaṃśa, twenty-eight) and partly from the tentative calculation underlying the latter view.[4] Let us now see whether it is possible to have a more definite finding.

The undated rock-edict of Aśoka, which is numbered xiii by scholars and which is substantively the last among the rock-edicts, gives us the information that when the edict was published Antiochus (Theos, King of Syria) and Magas (King of Cyrene) were reigning. Now Magas died in 258[5] B.C., and Antiochus had come to the throne in 261 B.C.[6] The date of the edict must, therefore, fall between these two years.

The date of the edict is the date of the publication of the complete series of the rock-edicts, for edict xiii is the concluding[7] substantive part of the series, and at the same time it is

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1 321 B.C. according to V. Smith (*Early History of India*, 2nd Ed., p. 39); between 320 and 315 B.C. according to Kern (*Manual of Ind. Buddhism*, p. 112).

2 Rhys Davids, *Encyclopaedia Britannica* (11th ed.), II, 764; Fleet, *ibid*, XIV, 623; Geiger, *Mahāvaṃśa* (1912), xxxiii.

3 V. Smith, *Asoka* (1910), p. 60.

4 Cf. "The thirteenth Rock Edict establishes the synchronism of Asoka with five Hellenistic kings .... The latest date at which all these kings were alive together is 258 B.C. The rock edicts belong to the thirteenth and fourteenth years of the reign of Aśoka rec oned from his coronation, which event, therefore, should have taken place about 270 B.C. The year 269 B.C. is probably nearly correct." V. Smith, *Asoka*, p. 60.

5 Bevan, *House of Seleucus*, i, 178.

6 Rawlinson, *Parthia*, p. 45. Bevan, *Enc. Bri.*, 11th ed., xxiv, 604.

7 The portion numbered 'XIV' by scholars is merely a colophon to the series; the series really ends with edict 'XIII'

not an earlier edict reproduced but is a new one written for the occasion. *The date of the publication of the series, and therefore also of edict xiii, cannot be earlier than the fourteenth year of the coronation of Aśoka,* as a preceding edict (No. v) mentions that year.

258 B.C. would be the latest possible date of rock-edict xiii. The inscription would not have contained the name of Magas among the living, had it been published after 258 B.C., the date of his death Now the edict itself is at least fourteen years later than the *Abhisheka.* Therefore (258 + 14 =) 272 B.C. is almost the lowest possible year for the coronation of Aśoka. I say 'almost' the lowest possible year, in view of a possibility of the news of the death of Magas not reaching India at the time of the publication of the rock-edicts. It is thus possible that it was 257 B.C. when the edicts were published in the fourteenth year of the *Abhisheka.* As Aśoka had established his hospitals in the kingdom of Antiochus and probably also in that of Magas (edict II) and as his missionary propaganda depended on his friendship with these individual rulers, it was a matter of vital importance to those charitable institutions established in Hellenistic kingdoms and to the propaganda generally to send news of a change amongst the personnel of those rulers. Even assuming that the missionaries of Aśoka remained silent, and that the Mauryan spies who, according to the Artha-Śâstra,[1] were posted in neighbouring states also remained inactive in the matter of conveying the news of the death of one of their emperor's friends, the news would have none the less travelled into India in a short time. The arch-rebel Magas, who had succeeded in asserting his independence against his sovereign of Alexandria, and who had just (258 B.C.) concluded a triumphant treaty with that great prince, was the observed of the Hellenistic political world at the time. The news of his exit from the political stage would have with all rapidity reached, and become widely known in, Bactria which was already brewing with the ferment of political ambition similar to that of Magas. And if the intelligence department under the Rājukas of the satrapies of the Paropanisadai and Aria also happened to be dull at the time, the Hellenistic trader from Bactria and Persia, who brought[2] *kauśeya,* "the Chinese cloth," the Bisî and great Bisî furs and Bactrian and *Vānāyuja* horses (amongst other things), would not have failed to bring the information into this country. If the diplomatic man

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[1] I, 14, pp. 24–26; I, 16, p. 32.

[2] See Artha-Śâstra, II, 11, pp. 79, 81; II, 30, p. 133. *Bisî* might be Aśoka's Viśas, the neighbours of *Yonas* (=Bactrians) of the R.E. XIII, *kauśeya* seems to be connected with some Chinese place-name. *Vanāyu* which in later Sams. is identified with Persia is very probably a form of Biainas or Van. I am thankful to my friend Mr. H. B. Hannah of the Calcutta Bar for the latter suggestion.

failed to do his duty there is no reason why the economic man should have also slackened his activity at the same moment. The most probable view, however, would be that there were resident envoys at the Courts of Aśoka's Western friends,[1] at any rate at that of Antiochus, as there had been Seleucid ambassadors at Pâtalîputra, and they would have sent all important political news to Pâtalîputra by messengers and couriers. The news of his death must have reached the court of Pāṭalîputra with the least possible delay, which would be amply covered by the allowance of one year whether intelligence came through the Persian Gulf[2] or overland. Making this allowance, 272–271 B.C. *must be the latest possible year of the Abhisheka.*[3]

Again, the fourteenth year of Aśoka's *Abhisheka* could not be dated earlier than 261 B.C., that is, the accession of Antiochus. The first year of the *Abhisheka*, therefore, could not be earlier than (261 + 14) 275 B.C. This would be the highest possible limit of the Abhisheka according to our data. The exact date would thus be somewhere between 275 B.C. and 271 B.C., both years inclusive.

Let us test the highest limit and see if we could not reduce it.

With regard to the date of Chandra-Gupta's conquest and accession to the throne of Magadha, the only thing which can be asserted with certainty is that it must have taken place some time after 326 B.C., towards the close of which year Alexander was told in the Punjab, just before his retreat, that Nanda was reigning over the Prāchis on the Ganges.

We learn from the Pāli authorities that Aśoka was consecrated four years after his accession. This seems to receive an indirect confirmation from an independent source. The Vāyu Purāṇa gives the total number of the Maurya reigns as 137 years, but its details, which seem to be perfect and borne out in the main by other documents, appropriate only 133 years to the rulers individually. The difference of four years might represent the alleged four pre-sacramental years of Aśoka's reign,[4] which would have been regarded by orthodox Hindu chroniclers

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[1] It is implied in the edict (XIII) that Aśoka's envoy did go to Magas: "Even those to whom the *dûtas* of the Devānāmpriya do not go," etc.

[2] The unknown passage from the Indus to Susa of Nearchus had taken, with its halts, about six months. A journey overland, at the rate of fifteen miles a day would have been easily accomplished in eight months, even if we exclude the pace of royal couriers who existed in India in those days (śighra-vāhanas, Arthaśāstra, II, 34. p. 141). The campaign of Alexander from Egypt to Susa had taken, with all the difficulties and delays of war, only six months.

[3] For the confirmation of this from Indian data see below, p. 322.

[4] Cf. V. Smith, E.H.I., p. 185, *n.*

as a period of interregnum from the point of view of the sacred Hindu Law. In any case there is no reason why we should disbelieve the datum of the Pāli chronicles on the point.

Taking our highest limit, 275 B.C., we obtain the highest possible date of Aśoka's accession as (275 + 4) 279 B.C. If we add to this (24 + 25) [1] forty-nine years, the period covered by the two preceding reigns, we get 328 B.C. according to the calculation as a possible date for Chandra-Gupta's accession. But this as we have seen above could not have occurred before 325 B.C. ; that is, at least three years must be deducted from the possible highest limit. *Hence the accession of Aśoka could not have taken place earlier than* 276 B.C. (279 − 3 = 276), *and his Abhisheka earlier than* (276 − 4) 272 B.C. The higher limit, thus, narrowed down, nearly coincides with the lowest as obtained above.

In view of this result the tentative dates 264 and 269 B.C., it seems, should now be abandoned. The improbability of the 264 B.C. date is apparent. According to this Magas would be named amongst living kings *eight* years (264—14 = 250 B.C.) after his death! Then if edict XIII was compo-ed in 250 B.C., the absence of the name of Dio lotus of Bactria, who had been Aśoka's next-door neighbour for about five years [2] by that date, would be surprising. The proposed calculation giving 264 B.C. would not be acceptable even if we corrected the reign of Bindusāra from 28 to 25 years, as even then the difference between the death of Magas and the edict would be too long, viz. of five years.[3] As to the figure 269 B.C., a similar objection suggests itself. Taking this as the abhisheka year, we get the result that (269 − 14) three years after his death Magas was described in the edict as a living sovereign, which is highly improbable.

As a corollary to our above calculation we have also to revise the accepted date of Chandra-Gupta's accession to the throne of Magadha.

If we accept, and there is no reason to reject, the datum of the Pāli chroniclers, that Aśoka reigned for four years before he was legally crowned, the date of his grandfather's accession to the throne would be dated in the year (272 or 271 + 4 + 49) 325 or 324 B.C. Thus the date generally accepted up to

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[1] When the Pāli chronicle assigns twenty-eight years to Bindusāra, it obviously includes the pre-sacramental years of Aśoka's reign Tāranātha's figure 35 (Schiefner, p. 88) though incorrect in its tenth digit confirms the Purâṇas with regard to the unit.

[2] Rawlinson gives the date of the foundation of the kingdom of Diodotus as 256 B.C. and Ed. Meyer as c. 255 B.C

[3] This, by the way, shakes the accuracy of the proposed date of 483 B.C. for the Buddha's death and the Pāli figure 218 for the years which elapsed between the Nirvāṇa and Aśoka's abhisheka. According to my cal ulation, which I set forth in my paper on the Śiśunāga chronology, 218 years had passed between the 8th year of Ajāta-Śatru's reign and the accession of Chandra-Gupta.

this time of Chandra-Gupta's succession (321 B.C.) has to be shifted back four (or, perhaps, three) years earlier.

The above result would yield the conclusion that even while Alexander was struggling through the deserts of Sindh and Baluchistan, Chandra-Gupta was busy founding his own power. The revolt of the "mercenary (=Hindu) army" who put to death the Macedonian general Philippos in command over the Punjab, in 324 B.C., was probably connected with the early exertions of Chandra-Gupta.[1] The period 325–324 B.C. appears to have been very momentous to him. He must have been rapidly and restlessly working over an arena as large as the regions between the Indus and the Ganges. His efforts seem to have been almost simultaneously fruitful both in the Punjab and the Prāchi, and probably more remarkably in the latter. The final crushing of the remnant of the Macedonian power must have followed his capital success in Magadha and would have to be dated in 324–323 B.C.

The entire theory of the hypothetical date of Chandra-Gupta's accession has been, up to this time, based on the assumption that he could not have undertaken his operations before the news of the death of Alexander reached India.[2] But, in the light of the now ascertained date of Aśoka's coronation, he does not seem to have waited for an opportunity such as that to be afforded by the death of Alexander. In fact there was no such necessity, for to all purposes Alexander's retreat was the demise of his prestige in India. Alexander could anticipate this, hence his herculean efforts to coax the army to march on towards the Nandan forces. His retreat, despite his manufacturing and leaving gigantic camping relics to impress 'future generations' or more probably the Prasii who might decide to advance and follow him in his retreat, was taken as a confession of weakness. The greatest opportunity was offered by the retreat itself; one had not to wait till his death. The "mercenaries" removed the symbol of Macedonian power, the representative of Alexander, while Alexander was still alive.

Thus the basis of assigning a later date to Chandra-Gupta's rise, the necessity for waiting till his death, not being maintainable, the earlier date (325-324 B.C.), given to us by historical data of the first eminence, ought to be accepted.

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[1] The story in the *Mudrā-Rākshasa* of the murder of the mlechchha Parvata through Chandragupta's stratagem of *visha-kanyā* is probably based on a tradition of the death of Philippos. *Philippos* in Prākrüta would have been changed into *Pirabo* or *Pirabao*, which when restored into Samskrüta would yield *Parvata* or *Parvataka*.

[2] "We may feel assured that as soon as the news of the conqueror's death had been confirmed beyond doubt, and the season permitted the execution of military operations with facility, a general rising took place, and that Macedonian authority in India was at an end early as 322 B.C. except the small remnant to which Eudamos continued to cling." V. Smith, *Early History of India*, pp. 114–5 [Second Edition].

Indian data: The above conclusion regarding the abhisheka year of Aśoka is confirmed from an independent datum which is purely Indian. Even if we had not had the synchronism afforded by rock-edict xiii and the date of Alexander's invasion, we would have been brought to the same conclusion by the Indian datum we are going to consider. The date of the death of Mahāvîra as understood by the Jainas themselves is 470 before the birth of Vikrama or 487 years before the Vikrama era, i.e., (487 + 58) 545 B.C.[1] Now Sthûlabhadra, son of Nanda's minister Śakaṭāla, died 219 years after Mahāvîra, the year Chandra-Gupta obtained sovereignty (IA, 1882, 246). The year of Chandra-Gupta's accession thus would be 220 A.M., or cir. 325 B.C., and consequently that of Aśoka's abhisheka (325-53) 272 B.C.

Thus we obtain cir. 272 B.C., both from Indian and foreign sources, as the first year of Aśoka's abhisheka and c. 276 B.C. for his coming to the throne.

M. Senart's calculation: Since writing the above note my attention has been drawn to M. Senart's calculation in the *Indian Antiquary*, XX, 242. The conclusion is the same as adopted by Mr. V. Smith. It runs as follows:—

"As the second edict belongs to the thirteenth year, "we are inevitably led to conclude that his twelfth year "corresponds to one of the year 260-258 B.C., say, to take "a mean. to the year 259. This calculation would fix his "coronation at about 269."

The points of difference between this and the calculation advanced here are these: the basis of my calculation is edict xiii which contains the names of the five 'Greek' kings, while edict ii has only Antiochus and "his neighbours[2]"; and

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[1] IA., XX., p 347, § 13; cf. Dr. Hoernle, p. 360. On the authority of the ancient gāthā (§ 13) the Nirvāṇa of Mahāvîra falls in 545 B.C. (Oct.). But according to the Jaina interpretation (*ibid.*), it would be a year earlier (546 B.C.). In the latter case Chandra-Gupta's accession would be dated in 326 (Nov.)–325 (Oct.) B.C.

In preference to the authority of the ancient and reasonable gāthās we cannot accept the erroneous and mediæval reckoning of Hemachandra. (Jacobi *Kalpa-Sûtras*, p. 8). Pālaka who was the son and successor of Pradyota, contemporary of the Buddha, is said in the gāthās to have ascended the throne of Avanti contemporaneously with the Nirvāṇa of Mahavîra. The tradition of Pālaka is thus very reasonable and the period assigned to him or to him and his successors, viz. sixty years, cannot be left out as has been done in the verse of Hemachandra. It was a mere oversight on his part to do so, if the verse as we find it is not mutilated. The mistake can be easily detected in the light of various other chronological data of the Jaina tradition, e g that regarding Subhadra, Bhadrabāhu, Vikrama (IA. XX, 350). and Sthûlabhadra. [The difference of four years between the two dates of Sthûlabhadra's death results from a mistake of three years in the earlier reckoning which I discuss in a separate paper on the Śaiśunāga chronology].

[2] Edict II runs: "Likewise on the frontiers, as (in the states

the date of the former would be the fourteenth as against the thirteenth year assigned to the latter. The difference thus resulting would carry the abhisheka a year earlier than M. Senart's date. Another year's difference results by M. Senart's taking the 12th year to fall between 260 and 258 B.C., while on his own hypothesis the thirteenth falls between 260–258 B.C.

"of) the Cholas, ... the Greek-king Amtiyoka and also those "kings who are neighbours of that Amtiyoka—everywhere Devānām- "priya King Priyadarśin has founded two (kinds) of hospitals."

Against this we have in Edict XIII: "And that conquest (of "Dharma) has been attained by the Devānāmpriya both here and "amongst all his neighbours, up to six hundred yojanas where the "Greek-king called Amtiyoka (is), and beyond this Amtiyoka (where) the "four 4 kings (are)—by the name of Turamaya . . . by the name of "Maka . . . . everywhere they follow the *dharmânuśasti* of the Devā- "nāmpriya."

It is to be noticed that in the latter edict the named kings are mentioned in connexion with the *Dharmānuśasti of Aśoka* as against the unnamed neighbours of Antiochus and the *establishment of hospitals* (or remedial institutions) *in their kingdom*. The two references are distinct and separate.

42. The Rev. L. Bernard among the Abors, and the Cross as a Tattoo Mark (1855).

A Note by the Rev. H. Hosten, S.J.

To complete Fr. Krick's remarks on the tattoo-marks of the Abors (Cf. *J.A.S.B.*, 1913, pp. 107-122), I add some extracts from letters of the Rev. L. Bernard, of the Foreign Missions of Paris, published in *The Bengal Catholic Herald*, Calcutta, 1855. I was not aware of these letters before, nor was l'Abbé A. Launay, the historian of the Society for Foreign Missions (Paris), though he had at his disposal other materials on Fr. Bernard's visit to the Abors. Cf. *La Mission du Thibet*, I. 257-266. We learn from them that, after the massacre of his two companions, Messrs. Krick and Boury, in the country of the Mishmis, Fr. Bernard, now left alone, boldly tried to force his way to Tibet through the land of the Abors. He reached the village where Fr. Krick had been in 1853, but was obliged to return, the savages apprehending danger to themselves, should any accident befall him. Speaking of the Abor tattoo-marks in the form of crosses, which his colleague, Fr. Krick, may more than once have commented on in his presence, Fr. Bernard refuses to see in them any Christian origin or signification. Nay, he appears to have had Fr. Krick in view, when he states that only a pious traveller's imagination could have interpreted them in the sense of Christian signs. These remarks, not mentioned by Launay, reduce greatly the importance attached by Fr. Gaillard (Cf. *J.A.S.B.*, 1913, p. 115, *n.* 4) to Fr. Krick's observations in this connection.

The extracts are as follows:—

Saikwah, Upper Assam, Dec. 21st, 1854 (*Letter to Archbishop Dr. P. J. Carew of Calcutta*): "....I intend starting in a few days on a new attempt to penetrate to our dear Mission. I shall not go through the Meesshmees. The officers of the Company object to my doing so. I should like very much to try the Aburs. Yesterday, the son of a great chief came to me, and engaged me to trust myself to his father. He said, 'The Padre [Fr. Krick] promised he would come to us, and instead of doing so, he went to the wicked Mishmees who killed him. Come to us; we shall accompany you on your journey.' And showing me a cross he bears on his forehead he said, 'I do not know the meaning of this: I am but a child, but our ancients say it is a sign of religion, and that you are our

Padres.'[1] The youth seems to be a single-minded man. Only I do not know if the acting Deputy Commissioner of Debroo will let me go. I did not say a word about it to him; but, he told me the other day that a chief of some village in daily intercourse with the Aburs told him that he had heard these Aburs saying, 'if we can get the Padres a little into the interior, we shall take advantage of it to put them in some trouble.' I will do what I think the best for the glory of God....."[2]

Shaikwah, Jan. 8th, 1855 (*Letter to the same*): "....I am still at Shaikwah. I expect to start in a few days to Thibet, through the Abors, if allowed: but if not, through Feizpore.. .."[3]

Dacca, June 9th, 1855 (*Letter to the same*).

"My Lord Archbishop,—About the end of December last I had the honour of informing your Grace that I intended to make a new attempt to enter our dear Mission of Thibet through some of the wild tribes inhabiting the hills north-east of Assam. In the beginning of January, I tried to make my way through the Abars, a very rude and apparently by no means a bloodthirsty tribe. I wished to see, whether it could be possible to penetrate into Thibet through that part of the country, or if, in case of difficulties which could be overcome by time only, they would allow me to remain and establish a Mission amongst themselves. These poor unfortunate savages, after objecting first to my entering their villages, because they had been told that I came to sow some poison around their houses to kill them, at length consented to admit me, saying: 'Well, after all, you may come. When you go away, we shall kill a dog, and it will keep the evil spirit away from the village.' I was exceedingly well received by everybody; but when I informed them of the object of my mission, they told me it was utterly impossible for me to go to Thibet through their country, on account of the snowy hills, and the difficulties I should meet at the hands of the other tribes I should have to go through. As to my remaining amongst them, they had many difficulties which I solved very easily: *viz.*, that they could not give me a nice house, good meat, plenty of wine, etc. But, there was a last one not so easy of solution I was, perhaps, a spy sent by the British Government. However, they pretended to be satisfied that I was nothing of the kind, but a poor Missionary sent by God, not to enjoy the good things of this world, but to live and die amongst the poor, to instruct them, to teach them the existence of another life, and the way to obtain the blessings thereof. After some days' stay in the

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[1] The man had probably learned this from Fr. Krick's intercourse with the tribe.

[2] *Bengal Catholic Herald*, 1855, vol. xxviii, p. 18.

[3] *Ibid.*, p. 48.

village, I was obliged to come down to receive the directions I expected from my superiors at Paris. I promised the Abars that I would come back, if my directors approved of my establishing a mission amongst them, because I think they would offer great chances of success for missionary labours. They are certainly rough and wild, but at the same time very energetic; they do not seem to be vicious, though the men dress rather indecently. I believe they are simple in their manners; the persons of the other sex are decently dressed, and there, like everywhere, they evince, much more than the men, signs of great kindness. They have no religious prejudices at all. they only believe in the existence of some evil spirits residing in the far-off hills. *I heard some of them saying that they had been formerly Christians: that they had the cross on their forehead: all this is the mere product of the pious traveller's imagination. The sign they have on their forehead we can hardly call a cross, the four branches being equal, and certainly they do not know the meaning of it. They have that sign as the Hindoos have some other.*

"At present, the route through the Abars is the only one which offers some hope of success towards Thibet in this part of India. If ordered to go again through the Misshmees, I would certainly obey, but with the certitude of being murdered. Unless I receive other directions from my superiors, I am going to make an attempt through Darjeelling. Some Officers in Assam told me they believed I could there find what I want, *viz.*, a village under the protection of the British flag, where I could find plenty of Thibetan or Boutan people to enable me to learn their language. I do not at all want to go at once to the centre of Thibet. If only, without exposing myself to certain death, I can establish myself amongst some native population, I will be satisfied. When I shall be in possession of the language, I shall be able to do my work slowly.

"It is in contemplation of these new attempts that I came down three days ago to Dacca....."[1]

I have examined Carl Ritter's abstracts of Wilcox's journeys of exploration in Assam (1826-27).[2] There is nothing, however, to show how Wilcox came by the map where it was stated that since the twelfth century there had existed a mission in the south of Tibet among a tribe called Shokhaptra. (Cf. *J.A.S B.*, 1913, p. 116 and *n.* 1.)

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[1] *Ibid.*, p. 331.

[2] Cf. *Die Erdkunde*, IV Theil. II Buch, Band III, Berlin, 1834, pp. 357-399. I have also examined Ritter's references to *Asiatic Journal and Foreign Register*, xxiii. 499. 799; xxiv. 44, 307, 434, 439; Febr. 1828, No. cxlvi, 202; xxvi. 524. Only vol. xxiv. 54, 431, alludes to the Catholic Missions in Tibet between 1624 and 1732.

43. Notes on the Biological Work of the R.I.M.S.S. "Investigator" during Survey Seasons, 1910–11 and 1911–12.

By Capt. R. B. Seymour Sewell, B.A., I.M.S., *Surgeon-Naturalist to the Marine Survey of India, Hon. Assistant Superintendent, Zoological Section, Indian Museum, Calcutta.*

(With one chart, XXV.)

Up to the present time it has been the custom for succeeding Surgeon-Naturalists to furnish an annual report to the authorities of the Royal Indian Marine dealing with the work carried out by them during each successive survey season. These reports were duly printed and published in the "Administrative report of the Marine Survey of India," but as this pamphlet is regarded as being of a "confidential" nature they were not available for the use of scientists in other countries. As a result it appears that, in a large number of cases, zoologists both in Europe and other continents are of the opinion that all biological work by the R.I.M.S.S. "Investigator" has ceased, and the post of Surgeon-Naturalist been abolished. The Director of the Royal Indian Marine has now been approached on the matter, and he has kindly given his consent to the publication in future of these reports in a more suitable periodical. In view of the above-mentioned misconception, I have thought it advisable to make the following "Notes" as full as possible, and in consideration of the fact that the creation of the appointment was due largely, if not entirely, to the exertions of the Asiatic Society of Bengal, I have decided to submit the paper to that Society for publication in their *Journal*.

The post of Surgeon-Naturalist was first created in the year 1875, at a time when the "Challenger" was still engaged on her voyage of discovery. The first officer to hold the post was Surgeon J. Armstrong: at that time, however, there was no survey ship capable of carrying out deep-sea soundings or biological investigations, and, in consequence, that officer had to confine his energies to shore collecting and dredging or trawling in shallow water. The R.I.M.S.S. "Investigator" was launched in 1879, but from that year, till 1884, the post appears to have been vacant. In 1884, however, the appointment was once more occupied, on this occasion by Surgeon-Naturalist G. M. J. Giles, I.M.S., and since then an I.M.S. officer has been continuously attached to the Marine Survey to carry on the biological observations.

A list of these officers and the dates during which they have held the post is given below :—

J. Armstrong	..	1875—79.
G. M. J. Giles	..	1884—88.
James Wood Mason (offg.)	..	1888.
A. Alcock	..	1888—92.
A. R. S Anderson	..	1892—1900.
J. Wemyss Grant (offg.)	..	1896—97.
A. F. McArdle	..	1900—02.
A. C. MacGilchrist	..	1903—05.
R. E. Lloyd	..	1905—07.
F. H. Stewart	..	1907—10.
R. B. Seymour Sewell	..	1910—12.
T. L. Bomford (offg.)	..	1912—13

The present R.I.M.S.S. "Investigator" was built by Vickers Maxim & Co., in the year 1907, to replace the old paddle steamer of the same name that had for a period of twenty-seven years (1881-1907) been constantly engaged in survey and biological work. She is a single screw steamer, fitted with a triple expansion direct inverted engine, developing an indicated horse power of 1500. She has a length, over all, of 232 feet 6 in. and a beam of 33 feet, her gross tonnage is 1014, and her mean draft is 12 feet. For carrying out deep-sea soundings she is fitted with a "Lucas" sounding engine of the usual pattern. When on surveying duty, she carries a staff of six surveying officers, two engineers and the Surgeon Naturalist and a crew of 110.

It was unfortunate that at the time the designs for the new ship were drawn up the requirements of the Surgeon-Naturalist were not taken more fully into account, for she is so constructed that it would be impossible to use a beam-trawl, and the present laboratory is merely a small cabin on the starboard side lighted only by the usual two portholes, nor are there any conveniences such as a swinging table or a constant supply of fresh water.

At the time when I first joined the ship in October, 1910, the Surgeon-Naturalist suffered from considerable disadvantages in the matter of apparatus for collecting or for hydrographical research. The only kinds of net provided were the Agassiz reversible trawl, a large and a small seine net and a few small dredges for work in the steam cutters and boats, and in addition a few small nets, such as surface tow-nets, which were made on board by the ship's carpenter. Investigations regarding the salinity and temperature of the sea-water have hitherto been impossible with any degree of accuracy, for the only instruments were an ordinary maximum minimum thermometer registering to the nearest degree Fahrenheit and a set of four hydrometer bulbs reading to the nearest degree: nor is the

annual grant sufficient to enable the Surgeon-Naturalist to do more than purchase the necessary stains, microscopic reagents, preserving materials, etc., necessary for a seven-months' cruise.

During the recess 1911, a mid-water net was constructed in the R.I.M. Dockyard, Bombay, and during the following season was made use of for the first time in the history of the Marine Survey of India. Although of a simple type and not fitted with any self-closing apparatus, it worked very fairly well and the results obtained amply justified its introduction. It is hoped that in the near future the R.I.M.S.S. "Investigator" will be fully equipped with nets and other apparatus for hydrographical research along the lines laid down by the "Conseil permanent International pour l'exploration le la mer" and thus be in a position to carry out full investigations, as regards both the hydrographic an l biological features, of the various regions of the Indian Ocean and its offshoots.

In an ordinary year, the R.I.M.S.S. "Investigator" leaves Bombay about the middle of October and proceeds to the survey ground, arriving there about the end of the month. She continues to survey the coast till about the middle of April, and then returns to Bombay, which she reaches early in May. During the time she is engaged in actual survey work there has hitherto been litt le or no opportunity for making collections of the bottom dwellers, and the work of the Surgeon-Naturalist is mainly confined to investigating the planktonic an l littoral faunas. During the run to and from the survey ground, however. the opportunity is taken to make several collections of the deep-water fauna in the Arabian Sea or Bay of Bengal, as well as to carry out a series of deep sea soundings. At the close of the survey season in May, the Surgeon-Naturalist repairs to the Indian Museum, Calcutta, and spends the recess there working out the collections made, or such portions of them as deal with the particular group or groups of animals of which he is making a special study.

Prior to the year 1911, it had been the custom to give a "Station Number" only to those localities, in which deep-water observations had been made, but during the recess of that year, it was decided, in consultation with the authorities of the Indian Museum, that this system of limiting the station numbers to the deep-water trawls was not altogether satisfactory, and that in future, as is done elsewhere, a sta ion number should be given to every locality where collecting of any kind was carried out. In consequence, the list of numbered stations for the last season shows a great increase as compared with those of any previous year. Unfortunately during the survey season 1911-12 I was only able to remain on board the R.I.M.S.S. "Investigator" till the end of November, being then recalled to Calcutta to take over temporarily the duties of Professor of Biology in the Medical College.

During the remainder of the season, however, the series of observations on the plankton were continued by my assistant Mr. J. Howard, I S.M.D., and several mid-water and bottom trawls were made during the run back to Bombay in April, and the results were preserved and forwarded by him to Calcutta.

During both seasons 1910-11 and 1911-12 the R.I.M.S.S. "Investigator" was occupied in surveying the Tenasserim coast.

Roughly speaking the area in which biological investigations were carried out extends from Hinzé Basin to Tavoy Point in 1910-11, and from Tavoy Point to the north end of Thamila or Iron Island in 1911-12.

These two areas present very considerable differences in the general topography of the coast line: in the northern area, the coast consists almost entirely of a series of rocky cliffs and promontories, interspersed with long stretches of clean sand that are frequented by turtles which come to lay their eggs; from the Tavoy River to the south, however, the whole coast-line is lowlying and the foreshore is, for the most part, one long stretch of mud-flats. Very similar differences exist between the Moscos Islands to the north and Tavoy Island to the south, for in the former the foreshore is composed almost entirely of rock and boulders with intervening stretches of sand, whereas in the latter, there is an almost complete absence of any sandy beach, its place being taken by boulders and small stones embedded in mud that has gradually silted up, and in places, especially in Port Owen and Bingham Bay, there are extensive mud-flats that are laid bare for a very considerable distance by the receding tide. The reason for this marked difference between the two areas is to be found in the Tavoy River; this brings down large quantities of mud and silt, which has, owing to the existence of a current that flows along the coast from north to south, gradually been deposited on the foreshore of both islands and Mainland to the south of the river-mouth. (Sewell, 1912, p. 350.)

One of the chief characteristics of the coast is the complete absence of any beds of "weed" or algae. Petersen (1911, p. 7) has recently called attention to the importance of such marine vegetation as a source of much of the food-supply of the fauna of the Danish waters. On the whole, the larger Algae seem to be very sparsely represented, at any rate as regards quantity, in Indian coastal waters; beds of *Zostera* sp. are frequent in the region of the Pearl banks at Manaar (Ceylon), and large quantities of *Cymodocea*, *C. ciliata*, *C serrulata* and *C. isoetifolia* have been recorded from Mauritius, the Seychelles, etc., but no such beds were found in the area under survey and the rocks and rocky reefs were absolutely bare. According to Petersen, much of the organic food supply in the sea is produced by the breaking down of the tissues of these

plants to form a "dust-fine detritus" some of which is deposited on the sea-bottom and which appears to form the chief food supply of many of the Mollusca, Polychaeta, and Echinodermata; it is interesting to note that although no such detritus producing beds were found, yet large quantities of vegetable detritus were present in the water, especially at the entrance to Hinzé Basin, the mouth of Tavoy River and at Port Owen, Tavoy Island, produced apparently by the destruction and decomposition of land vegetation and brought down to the sea by the streams and rivers at these points.

SHORE COLLECTING.

During the course of the two seasons I have been able to make several expeditions for the purpose of collecting and investigating the littoral fauna, and on four occasions I have remained on shore for periods ranging from a week to a fortnight. The results of these investigations are given below, and for purposes of reference I have divided those obtained at stations on the mainland from those on the various islands scattered along the coast.

Mainland Stations.

Hinzé Basin.—The entrance to the Basin consists of a wide channel about two miles in length and gradually narrowing from one and a half miles across at the entrance to about three quarters of a mile at its inlet into the Basin proper. The shores of the entrance partake of the nature of the neighbouring coast-line and consist of a series of small sandy bays, separated by reefs of rock and boulders. The Basin itself is formed by the union of three large creeks on the north and east, and one smaller one on the west; the creek on the south-east eventually runs into the sea about fourteen miles further down the coast. The shores of the Basin, as far as they have been investigated, consist almost entirely of Mangrove-swamps and mud-flats.

I remained in camp here from December 1st to 13th, 1910, and during the whole of that period the water at the entrance to the Basin was frequented by a species of Sirenian. These were all, apparently, examples of *Halicore dugong*, Illiger, and on one occasion as many as eight were seen together.

Close to the camp was a small freshwater stream that flowed into the sea just inside the entrance. This was frequented by numbers of large tadpoles, each marked with a row of three or four orange-coloured ocelli on the tail: it is interesting to note that these appear to belong to the same species as certain specimens obtained by Alcock from the Pamirs, at a height of 8,500 feet. They have been identified by Dr. Annandale as the tadpole of *Rana alticola*, Blngr. (Annandale, 1912, p. 22, pl. iv, fig. 1).

PISCES.

The receding tide left numerous small pools among the rocks: the e contained many small fish, among which the following were identified.

Mugil coeruleo-maculatus, Lacépede.
Mugil jerdoni, Day.
Mugil waigiensis, Quoy and Gaim.
Muraena meleagris, Shaw.
Periophthalmus koelreuteri (Pall).
Salarias dussumieri, Cuv. and Val.
Salarias lineatus Cuv. and Val.
Sciœna miles, Cuv. and Val.
Tetraodon fluviatilis, Ham. Buch.
Therapon jerbua (Forsk.).

With the exception of the two species of *Salarias*, all were quite young immature specimens.

All the freshwater streams flowing into the Basin were swarming with examples of *Haplochilus panchax* (Ham. Buch.), and a few exa nples of *Haplochilus melastigma* (McClell.) were also obt ined from the same s.urces. To one of the larger specimens of the former a parasitic Copepod, belonging to the Lernaeopodidae, was attached just beneath the left ventral fin.

INSECTA.

Several small pools of water in holes in the rocks above high-water mark were found t.) be swarming w.th mosquito larvae and nymphae; these, when hatched out, proved to be a species of *Culex*. The water, which was salt, had owing to evaporation be.ome exceedingly concentrated, and an analysis of a sample by the Chemical Examiner, Rangoon, gave the following results:—

Total solids = 6035·12 grains per gallon.
Chlorides = 3024·00 ,, ,, ,,

The water was thus nearly three times as concentrated as ordinary sea-w ter and yet these animals were able to live and breed in it freely.

CRUSTACE .—The following species are all fairly common on the beach or in the adjacent Mangrove swamps.

Grapsus strigosus, Herbst.
Ocypoda ceratophthalma Pallas), Ortm.
Ocypoda cordimana, Desm.
Sesarma quadratum, Fabr.
Sesarma taeniolatum, White.

The *Ocypoda ceratophthalma* were exceedingly common; as is well known these crabs burrow in the sand and make holes for themselves, in which they live. The larger specimens

merely dig out the sand and leave it lying in a small mound around the entrance to their burrow, but the smaller examples adorn the entrance and the part of the sand around with a "pattern" composed of numerous little sand balls.

Ordinarily the "pattern" is very simple, the sand balls being irregularly arranged round the entrance with two or three well marked paths running radially outwards (Fig. 1), but in certain other cases, and frequently in some particular portion

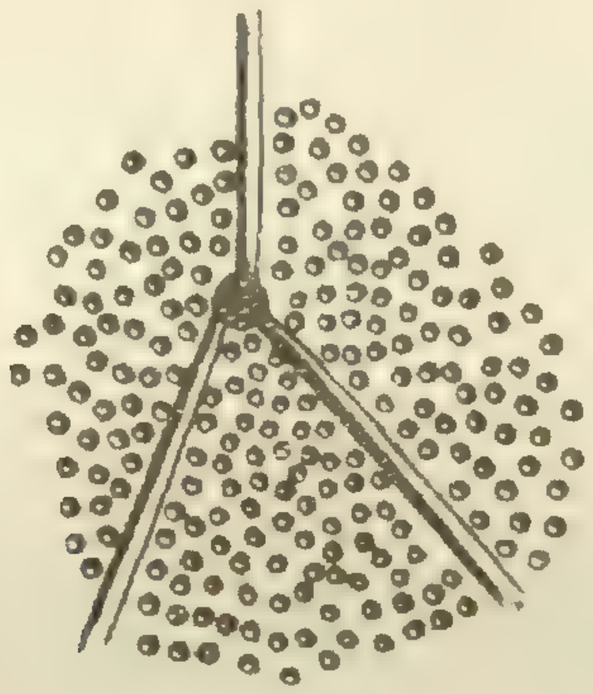

FIG. 1.

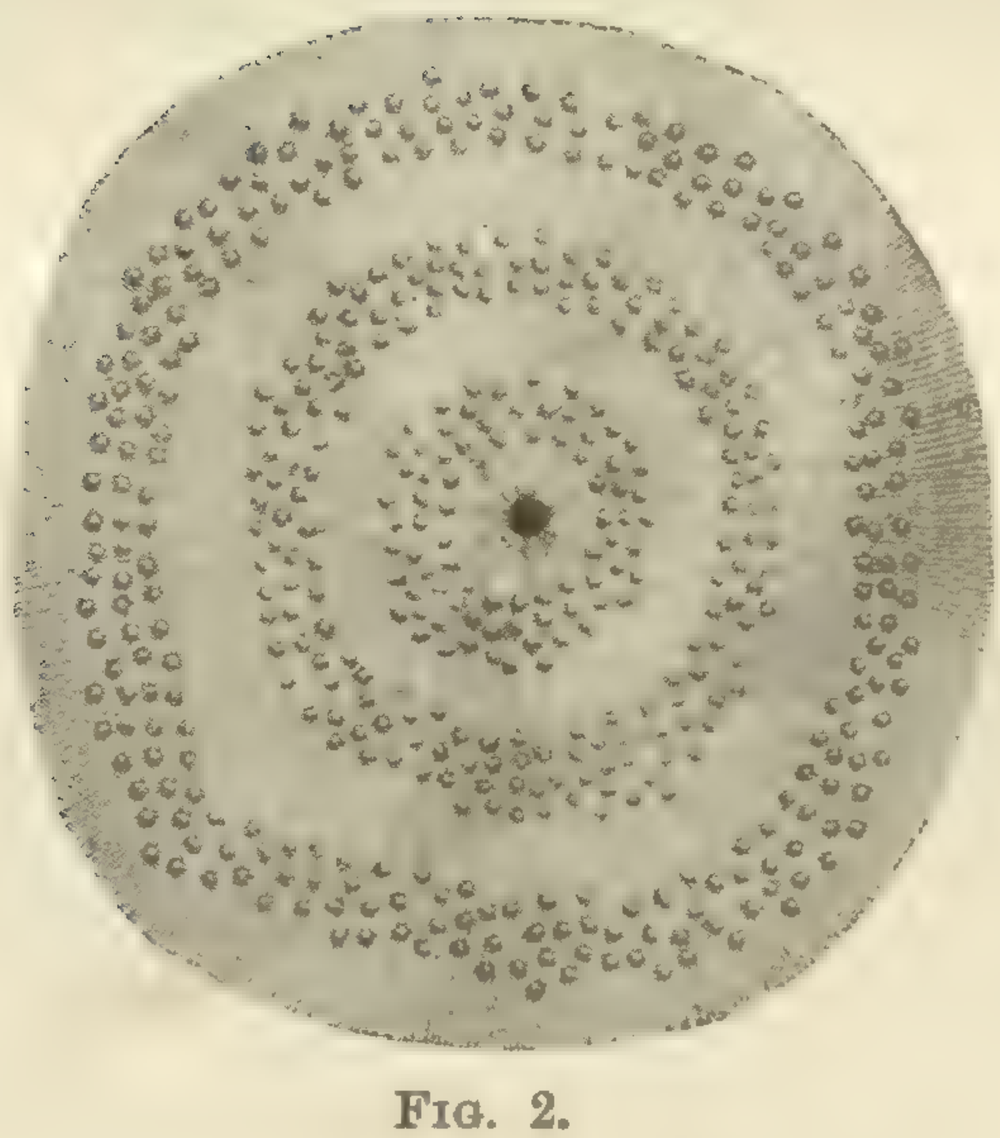

FIG. 2.

of the sandy beach, these crabs arrange the sand-pellets in a circular pattern, sometimes forming as many as six concentric circles (Fig. 2). These circles are not made one after the other, a second being commenced when the first had been completed, but all six would be commenced simultaneously and gradually continued round the hole until the pattern was complete.

For a long time I was unable to ascertain how the crab manufactures these little pellets of sand. That they were not

faecal in origin was shown by the fact that they were far too large, in many cases being almost half the size of the crab itself, and further, the intestinal contents are, on examination found to be quite soft and free from gritty matter. Apparently what happens is this ; the crab with its chelae shovels sand into its mouth and here a sorting process is carried out, anything edible being passed on into the stomach while the insoluble sand is rejected and appears as a small shining globule just in front of the centre of the frontal border of the carapace : when this globule has reached the correct size it is knocked off by a sharp movement of one, usually the right, chela.

The examples of *Ocypoda* and *Sesarma* crabs also exhibit a very interesting gradation in their colouring which appears to be an adaptation to the surroundings in which they live. The *Ocypoda ceratophthalma* living on the sandy beach were of a light colour with grey and brown spots and fine mottlings on the carapace and legs, and it was distinctly noticeable that those specimens, whose burrows were situated in the damp sand between high and low tide marks, were darker in appearance than those who inhabit the dry sand in the upper part of the beach.

Along the edge of the scrub at the upper part of the beach the ground was covered with a coarse grass ; here the *Ocypoda cordimana* were found living, and in this species the large chelae and the anterior part of the carapace is tinged with a yellow-green colour while the rest of the carapace and legs were marked with a finely-granular greyish-brown colour, a type of colouring that harmonized exceedingly well with their surroundings. The two species of *Sesarma* were both of a dark colour, but still showed a distinctly "protective" colouration. The examples of *S. quadratum* which were found frequenting crevices in the rocks and stones, were of a dark-brown colour dotted over with grey and yellow mottlings on the carapace, and the legs were of a light brown colour with purple-brown mottlings. The *S. taeniolatum*, however, inhabited the Mangrove swamps, and they showed an almost uniform purple-brown colouration of the carapace and legs while the great chelae were of a bright red colour.

In addition to the above, examples of—

Charybdis (Goniosoma) affinis, Dana.
Charybdis (Goniosoma) crucifera (Fabr.), A. M. Edw.
Charybdis (Goniosoma) rostrata, A. M. Edw.
Dorripe astuta, Fabr.
Matuta victor, Fabr., Hilgendorf.
Varuna litterata (Fabr.), A. M. Edw.

were obtained from the waters at the entrance, and the rock-pools were found to be swarming with examples of a species of *Leander*, many of which were ovigerous females.

Several examples of *Palaemon* sp. were obtained from the small freshwater stream, that flowed into the sea near the entrance (*vide* supra, p. 333).

Xiphosura.—Although no specimens of *Limulus* were obtained, their cast shells were exceedingly common on the long stretch of sand, that lies to the south of the entrance (also *vide* Rec. Ind. Mus., Vol. VII, p. 87, Calcutta 1912).

Mollusca.—A large collection of shells was made in this locality, as in others visited later: unfortunately in the present condition of the collection in the Indian Museum, it is impossible to work them out fully and consequently no detailed reference to this group will be made in this report. A list of the species, which have been provisionally identified by comparison with named specimens in the Museum collection, and their distribution, is given below (Table 1). In all cases the same nomenclature as that in use in the Indian Museum has been retained.

Hirudinea.—Several examples of a leech, probably *Limnatis granulosa* (Sav.), were obtained from the same stream mentioned above. These, along with the rest of the collection in the Indian Museum, have been referred to Mr. W. A. Harding of Cambridge, England.

Coelenterata.—Small dark-red sea anemonies were fairly common on the rocks to the south of the entrance (Kantaung Promontory), and several examples of a stalked species were obtained from a small patch of sandy mud at the mouth of the entrance: these latter were shaped exactly like a wine-glass, having a narrow stalk that suddenly widened out below into a broad flat plate, that served to fix the animal in the mud.

Byikhwaaw Bay.—This bay is situated at the extreme end of the long promontory that runs nearly due south between Tavoy River and the sea; it is large, with a shelving sandy beach, and at both extremities are rocky reefs, the rocks being encrusted with large barnacles and masses of rock-oysters. Between the bay and Tavoy River there is a patch of low-lying country, partly cultivated, but for the most part occupied by a large mangrove-swamp traversed by a creek that flows into the river.

On two occasions I was able to spend a week on shore here, the first was from January 9th to 14th, and the last from March 6th to 11th, 1911. At low tide numerous rock pools were left in the reef to the west of the bay, and these were swarming with animal life, among the most conspicuous objects being groups of Serpulid worms and brilliantly coloured sea-anemonies.

Pisces.—Numerous species of fish were obtained from the rock pools and from the waters of the bay, and among them the following were identified:—

Atherina pinguis, Lacépede.
Apogon fasciatus (White).* (= *A. novemfasciatus*, Cuv. and Val.)
Caranx affinis, Rüpp.
Caranx hippos (Linn.).
Chilodipterus lineatus (Forsk.).
Clupea longiceps (Cuv. and Val.).
Eleotris muralis (Quoy and Gaim) Cuv. and Val.
Equula fasciata, Lacépede.
Gobius ornatus, Rüpp.
Glyphidodon notatus, Day.
Glyphidodon septemfasciatus, Cuv. and Val. [= *Abudefduf septemfasciatus* (C. V.)]
Mugil waigiensis, Quoy and Gaim.
Muraena nebulosa, Ahl. [= *Echidna nebulosa* (Ahl.)]
Muraena tesselata, Richardson. (= *Gymnothorax favagineus*, Bl. and Schn.)
Periophthalmus koelreuteri (Pall.).
Platycephalus insidiator (Forsk.). [= *P. indicus* (Forsk.)]
Platyglossus leparensis (Bleeker).
Plesiops nigricans Rüpp.
Plotosus arab (Forsk.). (= *P. anguillaris*, Lacépede.)
Pomacentrus littoralis, Cuv. and Val.
Pristipoma furcatum (Bl. Schn.).
Salarias dussumieri, Cuv. and Val.
Salarias lineatus, Cuv. and Val.
Salarias quadricornis, Cuv. and Val. (= *S. rivulatus*, Rüpp.)
Scorpaena armata, Sauv.
Sebastichthys strongia, Cuv. and Val. (= *Sebastes strongia* C. V.)
Serranus boenack (Bloch.).
Serranus pantherinus (Lacépede).
Sillago sihama (Forsk.).
Stromateoides sinensis, (Euphr).
Therapon jarbua (Forsk.).

The freshwater streams also contained numerous examples of *Haplochilus panchax* (Ham. Buch.), and a species of *Gobius*: as regards the former, the examples obtained during my first visit in January agreed exactly with the description given by Day, but on my second visit I found that they had altered considerably as regards their colouration; this difference I

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* Since the above list was compiled, Dr. Max Weber has published his account of the fish obtained by the "Siboga" (Siboga-Expeditie, Monograph LVII. "Die Fische der Siboga-Expedition." Leiden. 1913). As he has in many cases altered the nomenclature, I have given in brackets his specific name in all cases where any change has been made.

attribute to the assumption of a special breeding colouration (Southwell and Sewell, 1913, p. 10).

TUNICATA.—On several occasions groups of Ascidians were washed ashore by the tide; each group consisted of six to eight individuals arranged side by side. The mouth and anal apertures were placed close together on the somewhat flattened upper surface, and in many cases a species of Hydroid was found growing round the oral opening. Each individual was about $1\frac{1}{4}''$ in length and was covered by a separate test, which was impregnated with particles of sand and was of a delicate purple-blue colour.

CRUSTACEA.—As usual the sandy beach was swarming with Ocypode crabs, *O. ceratophthalma* (Pallas), Ortm. and *O. cordimana* Desm, and, as in Hinzé Basin, these species showed the same peculiarities in both colouration and burrowing. The rock reefs were frequented by numerous Grapsoid crabs *Grapsus strigosus* Herbst and *Metapograpsus messor* (Forskal) A. M. Edw. Other species of crabs obtained in this locality are as follows:—

Dotilla myctiroides, Edw.
Epixanthus frontalis (Edw.) Heller.
Gelasimus annulipes, Latr.; Edw.
Matuta victor, Fabr.; Hilgendorf.
Neptunus pelagicus, Linn.
Neptunus sanguinolentus (Herbst.)
Sesarma quadratum (Fabr.)
Thalamita crenata (Fabr.) Edw.
Thalamita danae Stimpson.
Thalamita prymna (Herbst.)

Two of the above species had apparently made their appearance in this locality during the interval between my two visits. The first example was the *Gelasimus annulipes*: no examples of this species were obtained during my first visit, whereas on the second occasion that I visited the locality they were exceedingly numerous and conspicuous, so much so that had they been present previously I feel confident that they could not have been overlooked: moreover the "tide-watcher," who was living in camp in the Bay for a period of some three months, assured me that this species had only recently made its appearance. The second example was *Dotilla myctiroides*; this is a comparatively rare species, but on one occasion during my second visit, quite a small army of them were found marching across a patch of damp sand close to the rock reefs on the west side of the bay, though no examples had been seen during my first stay in the locality.

A single specimen of a large purple-blue Hermit crab belonging to the genus *Coenobita* was also obtained. It appears to be an example of *C. rugosa*, Edw.

STOMATOPODA.—Several specimens of *Gonodactylus chiragra*,

Fabr. were obtained among the rocks and boulders of the reef to the west of the bay.

ECHINODERMATA.—Several specimens of *Astropecten*, sp., and one example of *Pentaceros*, sp., were obtained on the sandy beach, and in one small rock-pool at the extreme end of the promontory to the west of the bay numerous examples of a spiny sea-urchin, black in colour, were found.

Large Holothurians, *Holothuria atra*, Jäger, were common on the rock reefs, and two examples of a Crinoid were also secured in the same locality.

MOLLUSCA.—The rock reefs, as has already been mentioned, were crowded between tide-marks with masses of rock-oysters and large examples of a species of *Balanus*. A fairly complete list of the mollusc fauna of the various localities is given in Table I (Appendix). I have throughout followed the nomenclature adopted by the late Mr. Neville, who arranged the Mollusc collection in the Indian Museum. It is interesting to note that this was the only locality where examples of *Meleagrina margaritifera* were found. According to Brown and Simpson, (1907, p. 10), the channel between Cap Island and the Mainland forms a large Pearl-oyster bed. I am, however, rather inclined to doubt this statement for, although scattered examples were found there was no trace of any large bed to be seen, and further, the tidal current through this narrow passage is extremely strong, being usually three knots, and it is difficult to see how spat could obtain a holding in any large quantity.

One or two small specimens of a Polypus were found in the rock-pools and on one occasion a mass of eggs of some fairly large Cephalopod was found attached to a rock near low tide mark.

COELENTERATA.—Two different species of coral were found growing in the rock-pools, one of these was a species of *Porites*. The other example I have been up to the present unable to refer to any genus; a colony of an Alcyonarian was also found in a rock-pool. It appeared to be same species as that dredged in shallow water in Nyan-byni Bay.

PORIFERA.—Two species of Porifera were also found growing in the pools: the first of these was of a brilliant orange colour and formed a thin sheet with numerous oscula encrusting the shells of a species of Lamellibranch mollusc. The skeleton consisted of numerous siliceous spicules arranged irregularly and the specimen was apparently an example of a species of *Halichondrina*. The second specimen was black in colour and formed a fairly thick layer, about $1\frac{1}{2}''$ in thickness, growing on the rock itself. Numerous large oscula were present and the skeleton consisted of a network of spongin with a few scattered rod-shaped siliceous spicules: it belongs to the group *Ceratina*. This latter form was interesting as it provided several examples

of commensalism : it formed a habitat for numerous Polychaet worms and small Ophiuroids, which were living in tubes and cavities in the sponge tissue, while scattered through the sponge with their mouth just level with the surface were several specimens of a species of *Balanus* : these belong to the genus *Acasta*, and probably represent a new species. A single small *Gebia*, sp. was also found inhabiting a larger cavity in the middle of the sponge; this cavity was about $1\frac{1}{2}''$ long and had three openings on the surface, while at the extreme blind end was living a small colony of Ophiuroids.

On the east side of Tavoy Point, at the entrance to Tavoy River, the fauna is much less abundant. Here the coast partakes of the same nature as the region to the south, the rocks on the beach are covered with a layer of slimy mud, and instead of intervening clean sand we get extensive mud flats. Here the *Periophthalmus koelreuteri* abounds and a single small specimen of *Limulus moluccanus*, Latreille, about 2″ in length, was obtained. The seine-net was used on one or two occasions but very little was obtained : the catch consisted of a few examples of *Triacanthus biaculeatus* and *T. brevirostris*, all immature, and a single large example of *Neptunus pelagicus*.

During my second visit to Byikhwaaw Bay, an expedition was made to Reef Island, which lies close to the right bank of the river near the mouth, for the purpose of obtaining specimens of the whip-scorpion *Hypoctonus binghami*, Oates, which is known to frequent this island. Unfortunately no examples were seen. The shores of the island consist of boulders and stones embedded in mud: specimens of *Periophthalmus koelreuteri* and a single example of a crab were found, but with these exceptions, the shores appeared to be uninhabited.

Island Stations.—A chain of islands extends down the whole length of the coast in this region ; to the north, off the coast between Hinzé Basin and Tavoy Point, are the North, Middle, and South groups of the Moscos Islands, while to the south of Tavoy River lie Tavoy Island and Iron Island, as well as numerous others too small to merit a specific name.

On several occasions I was able to land on the islands belonging to the various groups. As regards the Moscos Islands, the fauna does not appear to differ materially in the three groups, so I will therefore consider them together. In every case the shore consists for the most part of rock and boulders with an occasional sandy bay. The general fauna is as follows :—

Pisces.

Most of the islands in the Moscos Archipelago are utilized from time to time by the Burmese fishermen as their head-quarters during fishing expeditions ; a few huts are to be

found here and there on the larger islands, but the majority of the fishermen come off from the mainland.

Amongst others they catch the following species in fairly large numbers.

Carcharias, sp.
Chorinemus sancti petri, Cuv. and Val. [= *C. moadetta* (C. V.), Klunz].
Dicerobatis eregoodoo, Cantor.
Polynemus indicus, Shaw.
Pristis, sp.
Rhinobatus, sp.

Examples of the following species were obtained.

Ambassis urotaenia, Bleeker.
Atherina pinguis, Lacép.
Chilodipterus lineatus, (Forsk).
Clupea longiceps (Cuv. and Val.).
Glyphidodon sordidus, (Forsk.). [= *Abudefduf sordidus* (Forsk.)]
Mugil waigiensis, Quoy and Gaim.
Periophthalmus koelreuteri (Pall.).
Platyglossus leparensis (Bleeker).
Platyglossus notopsis (Bleeker).
Salarias dussumieri Cuv. and Val.
Salarias unicolor, Rüpp.
Therapon puta, Cuv. and Val.

Immense shoals of young and immature fish on several occasions came in with the rising tide into some of the sandy bays round these islands. These shoals consisted mainly of examples of *Therapon*, *Atherina* and *Clupea*. These young fish are captured by the Burmese fishermen in enormous quantities by means of large pocket-seine nets, in some instances as long as two hundred yards : the resulting catch is dried and is then imported into Burma for the manufacture of "ngapee."

On the Middle Moscos North Island a tidal creek was found that contained large numbers of *Haplochilus melastigma* (McClell.) ; in these examples the whole of the caudal fin was edged with a brilliant orange-yellow colour.

Crustacea.—As usual the sandy beach was frequented by Ocypode, and the rock reefs by Grapsoid crabs, and several examples of a Cenobite hermit-crab, apparently the same species as that found in Byikhwaaw Bay, were obtained on the Middle Moscos Islands.

Echinodermata.—Holothurians (*Holothuria atra*, Jager) occurred in large numbers among the rocks. Several specimens of a black spiny sea-urchin were found in a rock pool on the Middle Moscos South Island : these differed somewhat from those

obtained in Byikhwaaw Bay on the mainland in possessing longer and more delicate spines, and were apparently of a different species. A species of Spatangid was also found on the North Moscos Islands.

Mollusca.—The crevices and holes in the rocks were filled with large numbers of *Chiton* (*Acanthopleura*) *spiniger*, Sow. which the natives here collect and use as food.

Polychaeta.—Examples of Serpulidae are common in the rock pools round the islands.

Coelenterata.—Coral is abundant all round these islands and almost invariably, where there is a sandy bay, large beds and reefs of coral are to be found. It is interesting to note that as one passes gradually southward, the quantity of coral to be found gradually diminishes. Thus in the South Moscos Islands, coral beds are much less abundant than they are in either the Middle or North Moscos groups, while round Tavoy Island it is almost completely absent, only one or two small isolated colonies being found in rock-pools at the north entrance to Port Owen.

Numerous species were obtained on these islands belonging to the following genera :—

Favia (two species).
Fungia (a single species).
Galaxia ,, ,,
Goniastraea ,, ,,
Madrepora (several species).
Porites (a single species).
Symphillium (a single species).
Turbinaria ,, ,,

One of the examples of *Madrepora* was found to be infested with a barnacle, living in a small crater-like cavity at the tip of nearly every branch. This proved to be *Pyrgoma madreporae*, Borradaile, a species hitherto known only from the Maldive Islands.

Sea-anemonies are also quite common growing on the rocks : these were apparently of two kinds, in one the stomodaeum and disc were of a brilliant emerald green with dusky-mauve coloured tentacles, whereas in the second the colours were the exact opposite, the disc being a dull purple with green tentacles.

Tavoy Island, Fisher Bay, (station 414).

I landed here on November 20th, 1911, and remained on shore till the 25th. The coast is composed for the most part of boulders and small stones with occasional ledges of solid rock ; in the bay itself the shore consists largely of extensive mud-flats, which dry at low water, and intervening patches of mud and stones.

PISCES.

The freshwater streams contained large numbers of *Haplochilus panchax* (Ham. Buch.), and the mud-flats were frequented by *Periophthalmus koelreuteri* (Pall.). The following species were obtained from the waters of the Bay :—

Ambassis nalua (Ham Buch.).
Apogon lineolatus, Cuv. and Val. [= *Archamia lineolata* (C. V.)]
Equula fasciata (Lacép.).
Gerres lucidus, Cuv. and Val.
Gerres oeyena (Forsk.).
Haplochilus melastigma (McClell.).
Hemiramphus dispar, Cuv. and Val.
Lutjanus, sp.
Mugil waigiensis, Quoy. and Gaim.
Platycephalus insidiator (Forsk.). (= *P. indicus* Linn.)
Platycephalus tuberculatus, Cuv. and Val.
Sillago sihama (Forsk.).
Therapon jarbua (Forsk.).
Teuthis vermiculata (Cuv. and Val.). [= *Amphacanthus vermiculatus* (C. V.)]

Such rock pools as could be found contained numerous fish, for the most part examples of—

Gobius ornatus, Rüpp.
Salarias lineatus, Cuv. and Val.
Salarias dussumieri, Cuv. and Val.

A single example of an apparently new species of *Cryptocentrus* was discovered concealed beneath a large stone on the beach between tide-marks. A full acccount of this species will be published shortly in the "Records of the Indian Museum."

UROCHORDATA.—A single specimen of a species of *Balanoglossus* was found half-buried in the mud under a stone between tide-marks.

CRUSTACEA.—The stony beach was swarming with small crabs and under nearly every stone between tide-marks a small specimen of a Porcellanid was concealed. The rocks and boulders were also frequented, as usual, by the Grapsoid crabs *Grapsus grapsus* (Linn.) and *Metapograpsus messor* (Forskal.) Edw. Small patches of mud lying scattered among the stony parts of the shore were frequented by numbers of *Gelasimus tetragonum* (Habst), while the mud-flats at the head of the bay were inhabited by large numbers of *Gelasimus annulipes*, Latr., Edw. Although I watched these crabs most carefully I was unable to convince myself that the waving of the large claw served any obvious function sexually. The waving was of a slow and almost rythmical character and was not accelerated on the approach of a female, nor was it absent or

even less violent in those cases where no female was to be seen in the vicinity : there was no trace of the excitement described by Alcock (1901, p. 67). Pearse (1912, p. 113) has recently given a very good account of the habits of the fiddler-crabs in the Philippines, and so far as they go, my observations agree with his description.

The colouration of *Gelasimus tetragonum* (Herbst.) is peculiarly striking : the carapace in front is yellow, turning to a pale green in the centre and posteriorly to a bright blue, with a very distinct pattern outlined in rows of black dots.

Ventrally the abdomen was of a purple-blue tinge while the ischium and merus of the external maxilliped was a bright blue. The legs were orange in colour turning to a brown on the carpus and dactyl.

The large chela in the male was pale yellow with a splash of orange at the base of the fixed digit. In the female the chelae were splashed with blue on the hands and the carpus of the ambulatory legs was orange, not brown as in the male.

In addition to the above, the following species were obtained :—

Decapoda, Reptantia.

Charybdis (*Goniosoma*) *merguiensis*, de Man.
Clibanarius padavensis, de Man.
Epixanthus frontalis (Edw.), Heller.
Leptodius exaratus, Edw.
Macrophthalmus errato, de Man.
Macrophthalmus verreauxii, Edw.
Neptunus sanguinolentus (Herbat). juv.
Pilumnus vespertilio, Fabr.
Sesarma quadratum (Fabr.)
Thalamita crenata (Latr.), Edw.

Several examples of the following species proved to be ovigerous females, viz. *Gelasimus tetragonum*, *Leptodius exaratus*, *Metapograpsus messor*, and *Pilumnus vespertilio*.

As regards the examples of *Leptodius*, these were all, even the ovigerous females, quite small, measuring only 5-6 mm. in the breadth of the carapace : several specimens were found to be infected with a species of *Sacculina* and it is possible that the small size of the examples was the result of parasitization.

Decapoda, Natantia.

Peneus indicus, Edw. juv.

Numerous examples of Peneids and Alpheids were also obtained from the rock-pools; also examples of species of *Callianidea* and *Gebia*.

Stomatopoda.—A single specimen of *Gonodactylus chiragra*, Fabr. was captured in a rock-pool.

ECHINODERMA.

Two species of *Asteropecten* were obtained, viz. *A. indicus*, Döderlein and *A. andersoni*, Sladen. In addition, large black Holothurians, *Holothurea atra*, Jäger, were common on the beach and two specimens of a smaller variety, having a purple colour, were obtained from the same situation.

NERMERTINEA.

Two or three examples of a littoral Nermertine worm were obtained from the rock-pools and muddy beach.

COELENTERATA.—On several occasions the incoming tide brought in numbers of a species of Rhizostomous medusa, belonging to the genus *Lychnorhiza*. These, though apparently all of the same species, showed considerable variation as regards their colouring: in some they were transparent white, the bell being dotted over with numerous chocolate-brown spots, whereas others were of a uniform pale-blue and were unspotted, and it was noticed that the pale-blue variety was usually larger than the spotted one. In nearly every case the medusa was accompanied by one or more young larval fish. A few examples belonging to the genus *Cassiopea* were also obtained in the bay.

As already mentioned above a few isolated colonies of a species of *Favia* were found growing in rock-pools near the N. entrance to the Bay, but there were no large beds seen anywhere.

PORIFERA.—Two species of sponge were found growing on the rocks. Dr. N. Annandale has been kind enough to identify these for me: he informs me that one belongs to the genus *Spongosorites* and the other is an example of *Isodictya tubuloramosa*, Carter. This latter species was originally described from the Mergui Archipelago (Carter, 1889, p. 70). The present specimens agree closely with the type both in structure and external appearance, except that they are of a bright purple colour, whereas the type has completely lost any colour it may have had.

BOTTOM TRAWLING.

During the survey season 1910-11, it was only possible to carry out four trawls, at stations 388–391, but during the season 1911-12, six trawls were successfully carried out. Accounts of the fish[1] and crustacea[2] obtained during 1910-11 have already been published, so that no further report on these will be made. At station 388 (26-iv-11. 7° 44′ 10″ N: 76° 35′ 45″ E. 670 fathoms) a large number of examples of MADREPORARIA were obtained. These all belonged to the Turbinolidae and have been referred to the following species.

[1] Sewell, 1912 (*a*)

[2] Kemp and Sewell, 1912.

Stephanotrochus oldhami, Alcock.

Four examples were obtained and although exhibiting *inter se* a considerable range of variation, they appear to fall into line with other specimens in the Indian Museum, previously obtained by the R.I.M.S. "Investigator" and described by Alcock (1898, p. 19), under the above name.

Flabellum pavoninum, Lesson.

A single specimen was obtained and was referred to this species. The example is of interest in that, while undoubtedly belonging to the above species, yet in some respects it aproximates to *F. paripavoninum*, Alcock (loc. cit., p. 21), especially as regards the absence of a pedicle and the presence in its place of a "sessile scar of attachment." Its occurrence serves to justify Prof. Stanley Gardiner's (1904, p. 123) opinion that *F. pavoninum* and *F. paripavoninum* are, in reality, representatives of the same species.

Flabellum japonicum, Moseley.

Thirty representatives of the species were obtained, showing considerable range of variation both in the condition of the columella, as described by Alcock (loc. cit., p. 23), and in the form of the septa which varied from perfectly straight plates to a markedly crinkled condition, closely resembling that found in *F. laciniatum*.

A single example of *Cerianthus*, sp., was also obtained.

Polychaeta.—Numerous worms belonging to the family Maldanidae were obtained together with the tubes in which they live.

The results of the six-bottom trawls that were made during the survey season 1911-12 are, so far as they have been worked out at the present date, given below:—

Station 392.

8° 43′ 30″ N.
79° 00′ 00″ E. } Depth—400 fathoms.

On this occasion three or four sharks about 4 feet in length came up with the trawl. Unfortunately while the trawl was being brought alongside, two or three of the contained fish, one apparently an example of *Coloconger*, floated out through the mouth, and, although an attempt was made to recover them by lowering a boat, the sharks had already made use of their opportunity and they were lost irretrievably.

Pisces.

Macrurus macrolophus, Alcock.

Two examples were obtained and are referred to the above species.

Echinodermata.

Several examples of *Ophiuroidea* were obtained; also several specimens of *Asteropecten* and a single *Phormosoma*, sp.

ALCYONARIA.

Examples of both *Umbellula* and *Pennatula* were obtained.

MADREPORARIA.

Flabellum laciniatum (Phil) ; var *messum*, Alcock. Two examples were obtained, both, unfortunately, somewhat damaged, but it was obvious that both must be referred to this species and were in all probability examples of the variety first obtained by Alcock (1902, p. 31) in the Andaman sea and afterwards in the "Siboga" collection, where he gives it the name of var. *messum*. The margin of the calyx was not deeply cut into petaloid lobes, but much more nearly resembled the condition found in *F. japonicum*, Moseley. As regards the compressed flat sides and sharp wing-like lateral costae, the specimens were typical of the above species.

Caryophyllia, sp.

A single dead corallum, with the calicular margin somewhat badly damaged, was also obtained and is referred to this genus.

Station 395.

13° 29′ 00″ N.
97° 30′ 00″ E. } Depth—50 fathoms.

Station 396.

13° 29′ 30″ N.
97° 37′ 50″ E. } Depth—50 fathoms.

These two trawls were made on the same day at a distance of a few miles apart. In both cases the nature of the sea bottom was the same, consisting of a soft mud with numerous mollusc shells. The results obtained were very similar and I therefore have considered them together. The numbers given after the names of the species or genera refer to the trawl in which the specimen was obtained.

PISCES.

Amblyopus sp. (396). (=*Taenioides* sp.).
Arnoglossus macrolophus Alcock (396).
Laioptery. xanthosticta (Alcock) (395,396).
Bregmaceros sp. (395).
Champsodon guentheri Regan (396).
Ophichthys sp. (396).
Ostracion turritus Forsk. (396).
Synaptura altipennis Alcock (395).
Tetraodon immaculatus Bl. Schn. (396)
Uranoscopus cognatus Cant. (396).

CRUSTACEA.

Aegeon medium, Alcock and And. (396).
Arcania quinquespinosa, Alcock and And. (396).
Carcinoplax longimanus, De Haan., juv. (396).
Charybdis (*Goniohellenus*) *hoplites*, Wood Mason (395).
Egeria arachnoides (Rumph), Edw. (396).
Leucosia obtusifrons, De Haan (396).
Neptunus (*Amphitrite*) *argentatus* (White) A.M.E. (396).
Pariphiculus rostratus Alcock (396).

Two examples of a small species of *Munida* were obtained at station 396.

Metapeneus monoceros, Fabr. (396).
Parapeneus longipes, Alcock (395).
Solenocera sp. (395, 396).
Gebia sp. (395).

STOMATOPODA.

A single example of the rare *Squilla fasciata* De Haan. was obtained at station 395.

CIRRIPEDIA.

A single example of the barnacle, *Scalpellum rostratum*, Darwin, was also secured at station 395. Its occurrence is of interest, as this is, I believe, the first occasion on which it has been recorded from Indian waters, though it is common in the Malay Archipelago. The specimen is also from shallower water than any other species of the genus previously obtained by the R.I.M.S. "Investigator."

POLYCHAETA.

Several examples were obtained in both trawls. Subsequent examination shows that they belong to the following three families :—

Glyceridae (395).
Polynoidae (395,396).
Terebellidae (396).

COELENTERATA.

Examples of *Olindias malayensis*, Maas, were obtained at both stations, as also were numerous specimens of a Hydroid belonging to the genus *Lytocarpus*.

Station 464. 22-iv-1912.

6° 02′ 30″ N : 81° 29′ E.

Total soundings from 68 to 52 fathoms. Net used. Agassiz trawl.

This haul included a large number of Alcyonacea and Gorgonacea, representing about twenty different species; several sponges and corals were also present. Attached to these were numerous Ophiuroids and Crinoids. The fish were not numerous and those that were obtained were small, but on the other hand the Crustacea were particularly well represented.

The following species have been identified :—

PISCES.

Fistularia serrata, Cuv. (= *F. petimba*, Lacép.)
Scorpaena erostris, Alcock.

CRUSTACEA.

Cancellus investigatoris, Alcock.
Charybdis (*Goniosoma*) *orientalis*, Dana.
Eumedonus zebra, Alcock.
Eupagurus investigatoris, Alcock.
Hyastenus gracilirostris, Miers.
Hyastenus pleione (Herbst.).
Lambrus (*Rhinolambrus*) *cybelis* Alcock.
Naxia cerastes, Ortmann.
Naxia sp. (possibly *N. hystrix*).
Ptychogaster, sp.
Puerulus angulatus, Spence Bate.
Quadrella coronata, Dana.
Quadrella coronata var. *reticulata*, Alcock.
Raninoides serratifrons, Henderson.
Sphenomerus trapezoides, Wood-Mason.
Spiropagurus spiriger var. *profundorum*, Alcock.
Tozeuma armatum, Paulson.

And in addition several examples of a *Munida*, an Alpheid, and a Porcellanid.

The example of *Naxia cerastes* is of interest in that, while closely agreeing with the description and the type specimens of *N. cerastes*, it presents certain resemblances to *N. investigatoris* (*vide* Alcock 1895, p. 218). The present specimen shows the typical long rostral spines and the prominent supra-ocular spine, but it resembles the latter form in that the hands of the chelipeds are inflated, and the gap between the fingers of the chelipeds is intermediate in size between those in typical specimens of *N. cerastes* and *N. investigatoris*.

The spines on the distal ends of the meropodites of the last three pairs of legs, mentioned by Alcock as distinctive of *N. investigatoris*, are greatly reduced in both species, and the distinction does not seem to hold. It appears probable that *N. investigatoris* is merely a variety of *N. cerastes*.

STOMATOPODA : A single example of *Pseudosquilla monodactylus*, (A. M.-Edwards). As Nobili (1906, p. 336) has pointed

out, this scarce form is probably not a true species but a post-larval stage of some other member of the genus, probably ***P. ciliata*, Fabr.**

Station 465. 22-iv-1912.

5° 56′ N: 81° 22′ E.
Nature of bottom. Globigerina ooze.
Depth of net. 132-109 fathoms.
Net used. Agassiz trawl.

Pisces.

Antigonia capros (Lowe).
Callionymus kaianus, Gunther.
Chelidoperca investigatoris (Alcock).
Setarches güntheri, Johnson.

Crustacea.

Calcinus elegans (Milne-Edwards).
Mursia bicristimana, Alcock and Anderson.
Paquristes calvus, Alcock.
Paguropsis typica, Henderson.

In addition to the above, examples belonging to the Cephalopoda, Gastropoda, Echinodermata and Gorgonacea were obtained.

Station 466. 26-iv-1912.

9° 32′ N: 75° 45′ E.
Nature of bottom. Fine sand and rock.
Depth. 105 fathoms.
Net used. Aggassiz trawl.

While the trawl was being towed it caught on a rock and was badly torn, in consequence the resulting catch was very small.

The following were identified.

Pisces.

Champsodon guentheri Regan.

Crustacea.

Metapeneus coniger, Wood-Mason.

Station 467. 26-iv-1912.

9° 55′ N: 75° 41′ E.
Nature of bottom—Coarse sand and mud.
Depth—75-42 fathoms.
Net used—Agassiz Trawl.

PISCES.

Arnoglossus brevirictis, Alcock.
Callionymus longicaudatus, Schleg.
Champsodon guentheri, Regan.
Dysommopsis, sp.
Minous inermis, Alcock.
Platycephalus, sp.
Rhomboidichthys polylepis, Alcock.

CRUSTACEA.

Charybdis (*Goniosoma*) *orientale*, Dana.
Cryptopodia fornicata (Fabr.).
Egeria investigatoris, Alcock.
Heterocrypta, sp.
Lambrus longimanus, Leach.
Leucosia unidentata, De Haan.
Lupocyclus rotundatus, Adams and White.
Myra brevimana, Alcock.
Neptunus (*Amphitrite*) *argentatus* (White), A. M. Edw.
Parapeneus longipes, Alcock.
Randallia eburnea, Alcock.
Raninoides serratifrons, Henderson.
Spiropagurus spiriger, var. *profundorum*, Alcock.

In addition two specimens of a species of *Aphrodite* and examples of all three group of Echinoderms were obtained.

On one occasion an attempt was made to trawl from a steam-cutter in Nyan Byni Bay (13° 39′ N : 98° 7½′ E). The depth was about 5 fathoms and the bottom consisted of soft sand and mud with numerous small mollusc shells. The catch, which was small in quantity, consisted of the following :—

PISCES.—Several young examples of *Platycephalus indicus* (Linné) about 2″ in length.

CRUSTACEA.

Philyra scabriuscula (Fabr.).
Neptunus sanguinolentus (Herbst.).

MOLLUSCA.—Numerous mollusc shells. A small specimen of *Loligo*, sp.

ECHINODERMATA.—A single Ophiuroid, badly damaged.

COELENTERATA.—A few specimens of Alcyonarians, all belonging to the family Alcyonidae ; and one or two branches of an Hydrozoon.

MID-WATER TRAWLING.

During the season 1911-12, for the first time in the history of the Marine Survey of India, a midwater trawl was made use

of. Up to the present time four successful hauls have been made. Unfortunately the net in use at present is not a self-closing one, but it is hoped that in the near future this present apparatus will be replaced by one of a newer pattern.

Sation 393.

7° 21′ 6″ N. } Depth of net—400 fathoms.
85° 7′ 15″ E. } Total sounding—2000 fathoms.

Although great care was taken, it was found when the net was hauled on board that a large number of the specimens, especially the smaller fish and the larger crustacea, were somewhat badly damaged, but the Copepoda were in excellent condition.

The following specimens were identified:—

PISCES.

Cyclothone microdon (Günther).
Cyclothone signata (Günther).
Melamphaes mizolepis, Günther.
Vinciguerria lucetia, (Garman).

Examples of *Cyclothone microdon* (Günther) were of common occurrence: hitherto the "Investigator" had obtained this species on only two occasions, at Stations 13 and 55. Further examples have since been obtained with the mid-water net at Stations 461. 462, and 463, so that it would appear to be a common inhabitant of the mid-water in the Bay of Bengal.

A few examples of *Cyclothone signata* (Günther) were also obtained. As has been shown by Murray and Hjort (1912, p. 103), this species occurs in great numbers in the middle of the North Atlantic at a depth of 500 metres (approx. 270 fathoms), whereas *C. microdon* occurs at a somewhat greater depth, about 1,000 fathoms. The depths at which mid-water trawls have been made on the "Investigator" up till the present time range from 375 to 475 fathoms, and it is probable that the examples of this latter species were caught during either the ascent or descent of the net: this would also account for the difference in the numbers obtained in the two species.

A single example of *Vinciguerri lucetia*. Garman was also obtained at this station. This is, I believe, the first occasion on which this species has been recorded by the "Investigator": a second specimen was subsequently obtained at Station 463. At Station 4 2 a small example of a *Myctophum* sp. was obtained, while at Station 463, examples of a young *Argyreopelecus* sp. and *Astronesthes* sp. were captured: as regards the latter, it is too immature to be diagnosed with certainty, but appears to be an immature example of *A. indicus* Brauer.

TUNICATA.—Three examples of a species of *Pyrosoma* were obtained, and specimens of two species of *Salpa*, *S. hexagona*,

Quoy and Gaim. and *S. zonaria* (Pall.). In both these last cases it was the asexual form that was obtained.

CRUSTACEA.

Acanthephyra, sp.
Gennadas parvus, Spence Bate.
Gennadas scutatus, Bouvier : juv.
Hymenodora, sp.
Sergestes bisulcatus, Wood Mason.
Sergestes, sp.

Numerous examples of Euphausiacea, mostly young, were also obtained.

COPEPODA.

Augaptilus horridus, Farran.
Bathycalanus richardi, Sars.
Candacia norvegica, Borck.
Candacia pachydactyla (Dana).
Cornucalanus simplex, Wolfenden.
Disseta palumboi, Giesbrecht.
Eucalanus attenuatus (Dana).
Eucalanus elongatus (Dana).
Euchaeta marina (Prestand).
Euchirella dubia, A. Scott.
Euchirella galeata, Giesbrecht.
Euchirella maxima, Wolfenden.
Euchirella pulchra (Lubbock).
Gaetanus armiger, Giesbrecht.
Gaetanus latifrons, G. O. Sars.
Gaetanus miles, Giesbrecht.
Heterorhabdus grimaldi (Richard).
Heterorhabdus longicornis (Giesbrecht).
Heterorhabdus papilligera (Claus).
Labidocera detruncata (Dana).
Lophothrix frontalis, Giesbrecht.
Lophothrix, sp.
Lucicutia bicornuta, Wolfenden.
Lucicutia clausi (Giesbrecht).
Lucicutia maxima, Steuer.
Megacalanus princeps, Wolfenden.
Metridia ignota, Esterly.
Metridia macrura, Sars.
Metridia princeps, Giesbrecht.
Metridia scotti, Giesbrecht.
Mesorhabdus truncatus, A. Scott.
Paraeuchaeta barbata (Brady).
Paraeuchaeta bisinuata (Sars).
Paraeuchaeta californica, (Esterly).
Paraeuchaeta propinqua (Esterly).
Paraeuchaeta tonsa (Giesbrecht).
Paraeuchaeta weberi, A. Scott.
Pleuromamma abdominalis (Lubbock).
Pleuromamma gracilis (Claus).
Pleuromamma quadrungulata (F. Dahl).
Pleuromamma xiphias (Giesbrecht).
Rhincalanus cornutus (Dana).
Rhincalanus nasutus, Giesbrecht.
Scolecithrix frontalis (Giesbrecht).
Scottocalanus farrani, A. Scott.
Undeuchaeta intermedia, A. Scott.
Undeuchaeta major, Giesbrecht.
Undeuchaeta plumulosa (Lubbock).
Undinopsis, sp.
Valdiviella brevicornis, Sars.
Valdiviella gigas (Brady).
Valdiviella insignis, Farran.
Valdiviella oligarthra, Steuer.

The occurrence of many of these species is of interest, especially the rare *Metridia scotti*, of which numerous examples of both sexes were obtained. I am inclined to regard *M. atra*, Esterly, as identical with this species. Several examples of the hitherto unknown male of *M. macrura*, Sars, were also included in the haul. These examples can readily be distinguished from the males of *M. princeps*, and I cannot agree with Wolfenden (1908, p. 15) that they are the same species.

OSTRACODA
AMPHIPODA } Numerous examples were obtained.
COELENTERATA.

A single example of a purple-coloured deep-water Medusa was present.

Station 461. 19-iv-1912.

10° 15′ N. : 90° 15′ E.

Total sounding—1800 fathoms (from reading on chart: an actual sounding was not taken).
Depth of net—375 fathoms.

PISCES.

Numerous small fish, including both adult and larval forms, were obtained, and amongst the latter was one specimen of *Antigonia capros*, Lowe.

TUNICATA.

Numerous *Pyrosomata*, mostly small transparent colonies of four individuals. Two species of *Salpa*: *S. multitentaculata*, Quoy and Gaimard, numerous sexual individuals measuring about $\frac{1}{2}''$, with developing embryo, and *S. democratica*, Forskal, several asexual forms.

CRUSTACEA.—As usual numerous Copepoda, Ostracoda and Amphipoda were obtained; these at present have not been worked out. Among the Decapoda were examples of *Acanthephyra sanguinea*, Wood Mason, and *Sergestes, sp.*

CHAETOGNATHA.—Numerous examples of *Sagitta*, sp.

COELENTERATA.—Siphonophora were common and one example of a Beroe was obtained.

Station 462. 20-iv-1912.

9° 08′ N : 87° 25′ E.

Depth of net { (*a*) Surface tow-net—0 fathoms.
(*b*) Mid-water net at 475 fathoms.

PISCES.

Melamphaes mizolepis, Gnthr.

TUNICATA.

A *Pyrosoma* colony, 4″ in length.

CRUSTACEA.

Decapoda.

Acanthephyra, larva.
Anomura, larva.
Euphausiacea sp., numerous examples.
Gennadas parvus, Spence Bate.
Gennadas scutatus, Bouvier, var.
Gennadas, sp.
Pasiphaea, sp. larva.
Sergestes bisulcatus, Wood Mason.
Sergestes, sp.

In addition there were numerous Copepoda and Ostracoda.

MOLLUSCA.

Three small Cephalopods.

POLYCHAETA.

An example of a large *Tomopteris* was obtained : the proportions were as follows :—

Length—$2\frac{1}{8}$ inches.
Length of seta—4 inches.
No. of segments—43.

The narrow caudal region had been broken off ; a detached caudal region, probably belonging to this specimen, was present measuring $1\frac{3}{4}''$.

Station 453. 21-iv-1912.

7° 37′ N. : 81° 29′ E.

Nets { Surface tow net —0 fathoms.
Mid-water net—400 fathoms.

PISCES.

Vinciguerria lucetia (Garman).

CRUSTACEA.

Examples of *Pasiphaea*, *Sergestes* and *Gennadas*.
Numerous Copepoda, etc.

SIPHONOPHORA.

Abyla trigona Q. and G. (?)
Diphyes appendiculata Esch.

POLYCHAETA.

A second large *Tomopteris* sp. was obtained : its proportions are as follows :—

Length of body—3½ inches.
,, ,, seta,—5½ inches.
No. of segments—43.

Unfortunately the tube containing the surface collection was broken in transit and its contents lost.

OBSERVATIONS ON THE SURFACE PLANKTON.

During both years a large number of collections of the surface plankton were made at different stations: in the first survey-season 1910-11 numerous tow-nettings were taken in the region of the coast from the Middle Moscos Islands to Tavoy Point, and during the second year 1911-12, a further series of collections was made at stations extending from Tavoy Point to the north end of Iron Island.

In addition to these, tow-nettings were also taken of the plankton at the mouth of Rangoon River (station 394) in Hinzé Basin and at stations 393, 395 and 396, where bottom trawls were also made.

The results obtained in the more northerly region as regards the occurrence and distribution of the diatom flora and Copepoda have already been published. (Sewell. 1912 (b), p. 349.)

I have there shown that in this region the plankton exhibits a regular banded arrangement, so that the region can be divided up into four areas: in the more southerly region from Tavoy Point to Iron Island there was no indication of any such division, the planktonic distribution being uniform throughout the whole area. Here the diatoms present were for the most part examples of *Chaetoceras*, *Rhizosolenia*, *Asterionella*, and *Bacteriastrum* with usually some examples of *Ceratium tripos*: in this respect, therefore, the whole of this region is continuous with the area that runs northward from Byikhwaaw Bay and the mouth of Tavoy River to the South Moscos Island.

During the later part of January and February, 1912, large numbers of *Coscinodiscus* were present in the surface tow-nettings, but as they were found equally numerous at widely-distant stations and at stations where on previous visits they had been absent or rare, it would appear that this change is probably a seasonal one.

As regards the total quantity of plankton obtained at the various stations, this was found to vary very considerably in different localities. As one would naturally expect, it was much more abundant in and around Port Owen, Tavoy Island, than in other parts more remote from land; and although the observations are not sufficiently numerous for the results to be conclusive, yet they indicate that the surface plankton was, on the whole, more abundant towards the southern end of the area

under investigation than in the more northerly region around the mouth of Tavoy River. A study of the various results obtained round Port Owen, Fisher Bay (13·06 N : 98·19 E.), also shows that the plankton decidedly increases from early in November to the end of December, and beginning of January and then once more diminishes.

In the accompanying tables (Appendix, II and III) I have indicated the presence or absence of most of the chief constituents of the plankton in the various hauls, and below I append a few notes on certain animals that appear worthy of further notice :—

Pisces.—Fish-eggs and larvae were of frequent occurrence, and among the latter were several examples of *Leptocephalus* ; these varied very considerably in size and it is probable that more than one species was represented. At station 404, a fine example of a Pleuronectid larva was obtained. It appears to belong to the genus *Citharichthys*, and very closely resembles the *C. aureus*, Day. (1889, p. 440, fig. 156). It is not identical, however, with this species, and a full account will, it is hoped, be published shortly.

Two young examples of a species of *Monacanthus* were obtained at Station 443. In both the whole body and head are covered with short, sharp and slightly recurred spines, which are continued for some distance up the base of both dorsal and ventral spines and are present in rows up the base of each fin-ray in the vertical fins.

While the ship was at anchor at station 599, two large shoals of Pomfret (*Stromateoides sinensis*) remained swimming backwards and forwards close to the ship on the shady side for some hours. One shoal contained between seventy and eighty specimens. These shoals would swim away from the ship for about twenty yards and then at a given moment every individual would turn, and the whole would swim back to the ship's side again. It was extraordinary to note the regularity with which the change of direction was accomplished, every individual in a shoal turning at exactly the same moment. The occurrence of large shoals of Pomfret at the surface has also been observed by Jenkins (1912, p. 51).

CEPHALOCHORDA.

Amphioxides valdiviae.—A single example of an *Amphioxides* larva was obtained at station 399.

In length it measured	.. ..	5·01 mm.
Proportion of length to breadth	..	11·36
Proportion of post-anal length to total length		7·13

There are twenty gill clefts present, and the mouth extends back to the level of the 8th gill bar. The end of the gill region

is at the level of myotome 24; while the anal opening is at the level of myotome 54, and there are twelve post-anal myotomes. There are about five fin ray boxes present to every myomere throughout the whole length of the animal.

From the above characters, it would appear that this must be an example of *A. valdiviae.*

TUNICATA.—The two commonest forms of surface-frequenting tunicates were *Salpa cylindrica*, Cuv. and *Salpa democratica* Forsk.

Throughout the whole season from November to April the former species is exceedingly common in these waters, and on one occasion as many as 500 were obtained in a single haul. They were invariably individuals of the "solitary" type, and in the majority of cases possessed a well-marked stolon, with a chain of developing young. The examples of *S. democratica* were small, measuring from 6—7 mm. in length.

CRUSTACEA.

Decapoda.—Numerous examples of *Lucifer* were obtained in the surface trawls: they all appear to belong to a single species, *L. typus*, Auct.: during the months of March and April they were exceedingly common, and at this period of the year many of the males were carrying ripe spermatophores.

Amphipoda.—During February, the specimens of *Phronima* obtained were almost invariably females. These were living in a colourless transparent barrel-shaped test that judging from its appearance had originally belonged to a species of *Oikopleura.* These females were usually accompanied by numerous young that were clinging to the sides of the barrel.

Copepoda.—The various species of Copepoda obtained in the region of the coast between Hinzé Basin and Tavoy Point have already been determined and an account of them published. (Sewell, 1912 (*b*)). In the more southerly region from Tavoy Point to the north of Iron Island, the same species were obtained, so that it is unnecessary to give any further account of them.

During the latter part of the survey season 1910-11, a large number of observations were taken with a view to investigating the numbers of Copepoda frequenting the surface. These observations extended from February 3rd, 1911, to April 6th, 1911, with occasional intervals, when the ship returned to Rangoon to coal or when I was in camp ashore. The results of these investigations have been worked out and are given below. In Table IV are contained the results derived from a series of tow-nettings taken while the ship was making soundings. I have made no attempt to calculate the numbers of Copepoda present per cubic-area of water, as the data at my disposal was not sufficient; I have instead reduced the figures to the number caught per hour, and, as, in all cases, the same

net was used and the rate of steaming was throughout practically constant, viz. five knots per hour—the figures may, at least, be taken as having a relative value, indicating the varying richness of the Copepod fauna in the different areas at the time of investigation.

A consideration of these results shows very clearly that, in this region of the coast, the number of Copepoda frequenting the surface bears a very close relationship to the state of the tide, a tow-netting taken at or near low water always showing a marked superiority as regards numbers of copepods

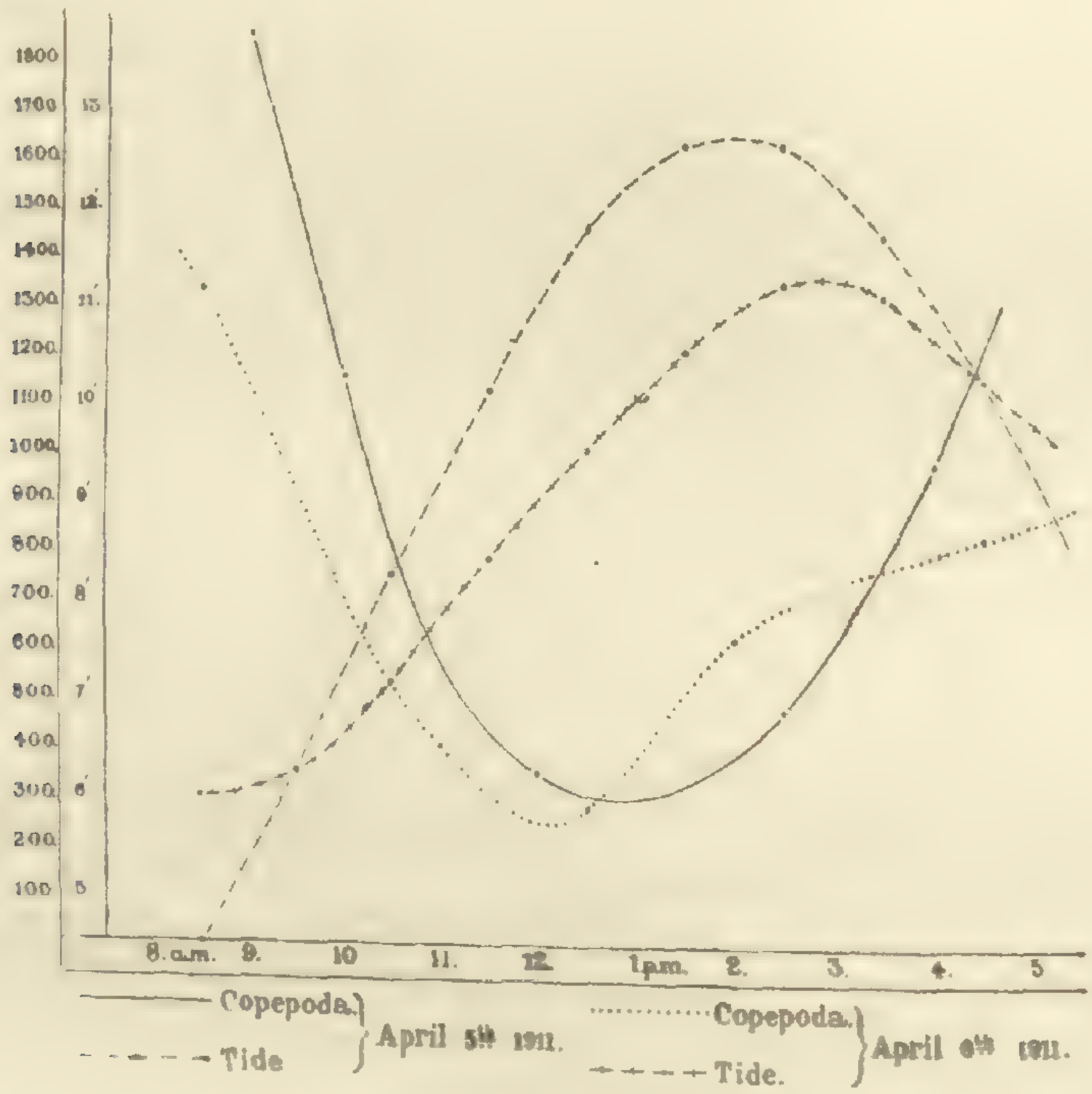


FIG. 3.

NOTE.—The first column gives the numbers of Copepoda, while the second indicates the height of the tide in feet.

present, over one taken at or near high-water; in order to test this more fully, on two consecutive days (April 5 and 6, 1912) a number of observations were taken and the results obtained have been plotted out in the accompanying diagram fig. 3.

The tidal curve given is plotted from the actual readings of the rise and fall taken by the tide-watcher in Byikhwaaw Bay on the same days, and therefore the tidal curve for the locality where the tow-nettings were taken, i.e. in the region of the S. Moscos Islands, would be slightly later.

It appears to me that two explanations of this variation are possible; firstly, it might be due to a horizontal move-

ment, a richer fauna being brought down the coast by the tide, which in this region sets up and down the coast, the direction of the flood being in the main to the N.-N.-W. and of the ebb to the S.-S.-E., or secondly, it might be due to a vertical movement, the Copepoda sinking below the surface at the time of the flood and high water, and rising again when the ebb tide is established.

That it is not due to the former is shown by the fact that (1) the alteration in numbers does not exactly coincide with the tidal variation, but precedes it by about two hours, the lowest number of Copepoda on the surface occurring about two hours before high-water, and (2) although numerous tow-nettings were taken all over the region between the Middle Moscos Islands and Byikhwaaw Bay, there was no evidence of any variation in the local richness of the fauna such as this view presupposes to exist. We therefore have to fall back on the second explanation, and such evidence as I have been able to accumulate tends to show that this is the correct one.

A series of vertical hauls of the tow-net taken at different states of the tide in or near Byikhwaaw Bay, gave the following vertical distribution.

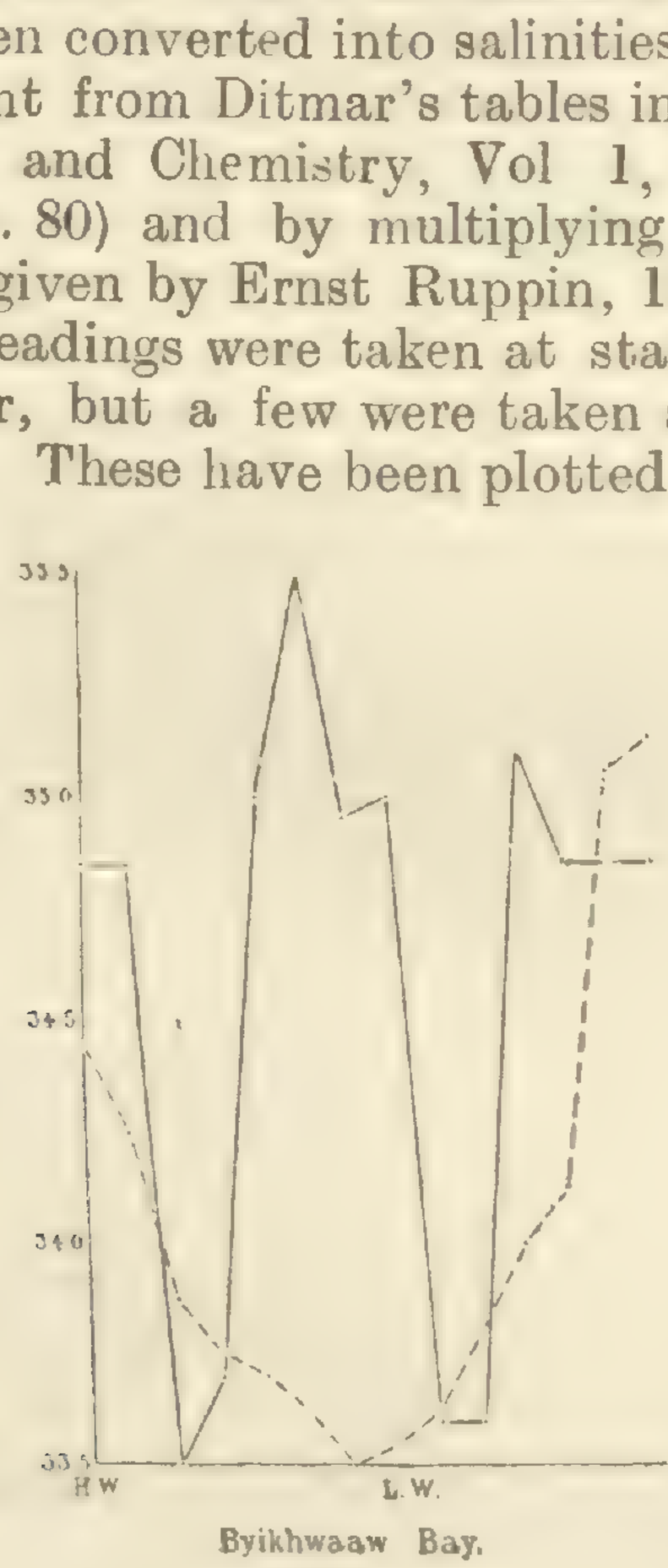
Position.		State of Tide.	No. of Copepoda obtained.			
N.	E.		1st fathom.	2nd fathom.	3rd fathom.	
13·52½	97·59½	Ebb. ..	2,040	2,550	..	Adults.
			4,080	**11,730**	..	**Nauplii.**
13·50	97·56	Flood ..	1,750	3,890	1,260	Adults.
			2,770	**1,210**	**3,850**	**Nauplii.**
13·33	98·8½	Low water	3,560	1,790	1,630	Adults.
			16,290	**1,020**	**3,310**	**Nauplii.**
		High water	1,660	2,550	1,910	Adults.
			5,090	**12,200**	**11,200**	**Nauplii.**

The cause of this vertical movement I am inclined to attribute to a change in the density of the sea-water. That such a change does actually cause a rise and fall of these animals has been shown by Professor Loeb. (1893, p. 96).

Observations on the density of the sea-water were taken every morning at 7.30 : the readings recorded were the mean

of the results obtained from four different hydrometers; as already pointed out, these are only capable of recording to the nearest degree, so that it was not possible to get a more accurate result. At the same time the temperature of the surface water was noted with a thermometer. The densities so obtained have been converted into salinities by calculating the chlorine equivalent from Ditmar's tables in the "Challenger" Reports (Physics and Chemistry, Vol 1, Table VII, p. 70, and Table IX, p. 80) and by multiplying this figure by the factor 1·7974, as given by Ernst Ruppin, 1911.

Most of the readings were taken at stations widely distant from one another, but a few were taken at different dates in Byikhwaaw Bay. These have been plotted out, according to



Byikhwaaw Bay.

FIG. 4.

NOTE.—In this and the succeeding diagrams, the interrupted line shows the rise and fall of the tide, and the continuous line that of the salinity.

the state of the tide at which they were obtained, the necessary data being obtained from the observations recorded by the tide-party stationed in the bay itself. The result is shown in the accompanying diagram.

Although the results obtained were not very satisfactory, they tend to show that in this region, at any rate, there is a distinct fall and subsequent rise in the salinity of the water during the rise of the tide, due apparently to the fact that on the ebb the fresh water coming down the Tavoy River causes a lessened salinity in the region round the mouth, and with the rise of the tide this water is carried past Byikhwaaw Bay up the coast towards the South Moscos Islands, a second fall and rise taking place during the ebb.

During the second season 1911-12 a further attempt was made to investigate the changes in the salinity : unfortunately there was no available apparatus on board for preserving and storing water-samples, so that all the chemical investigations had to be done at the time. A series of samples were collected every hour, both at station 399 at the mouth of Tavoy River, and in Port Owen, Tavoy Island, during a period of twelve hours, thus covering one complete rise and fall of the tide. These samples were all carefully titrated *with the same solution of* $AgNO_3$. The solution was prepared as nearly as possible to deci-normal strength, but as this could not be done very accurately the resulting figures have only a relative value.

The results are given below—figs. 5 and 6—and they show very clearly that here at any rate there is a distinct fall in the salinity during the flood tide and a rise at the ebb.

FIG. 5.

In this region the set of the tide is the exact opposite to what it is in the northern area. The ebb tide runs N.N.W. and the flood S.S.E., and the results obtained at the different localities, combined with a study of the tidal currents, tend to show that during the ebb tide, owing to the fresh water coming down the Tavoy River, there is an area of lessened salinity created in the region round the river-mouth. When the tide commences to flood, a strong current sets in from the deeper waters offshore, and runs in an easterly direction between the South-Moscos Islands and Tavoy Island, and then divides into two streams, one running towards the north, in a N.N.W. direction between the South Moscos and the mainland, and the other to the S.S.E. between Tavoy Island and the coast.

As a result the water of the area of lessened salinity is swept

in both directions, part passing northwards past Byikhwaaw Bay, thus causing the fall and subsequent rise in the salinity curve, and part passing to the south causing the fall in the salinity of the sea-water in Port Owen and the region between it and the mainland.

Esterly (1912, p. 294) has, as a result of his experiences in the San Diego region, come to the conclusion that salinity is a negligible factor in the distribution of the surface Copepoda, but in his observations the range of variation was only from 33·604 to 33·649, whereas in the present case it varied from 30·618 to 31·424 at the mouth of Tavoy River and from 30·112 to 31·200 at Port Owen, and it would seem probable that Esterly's

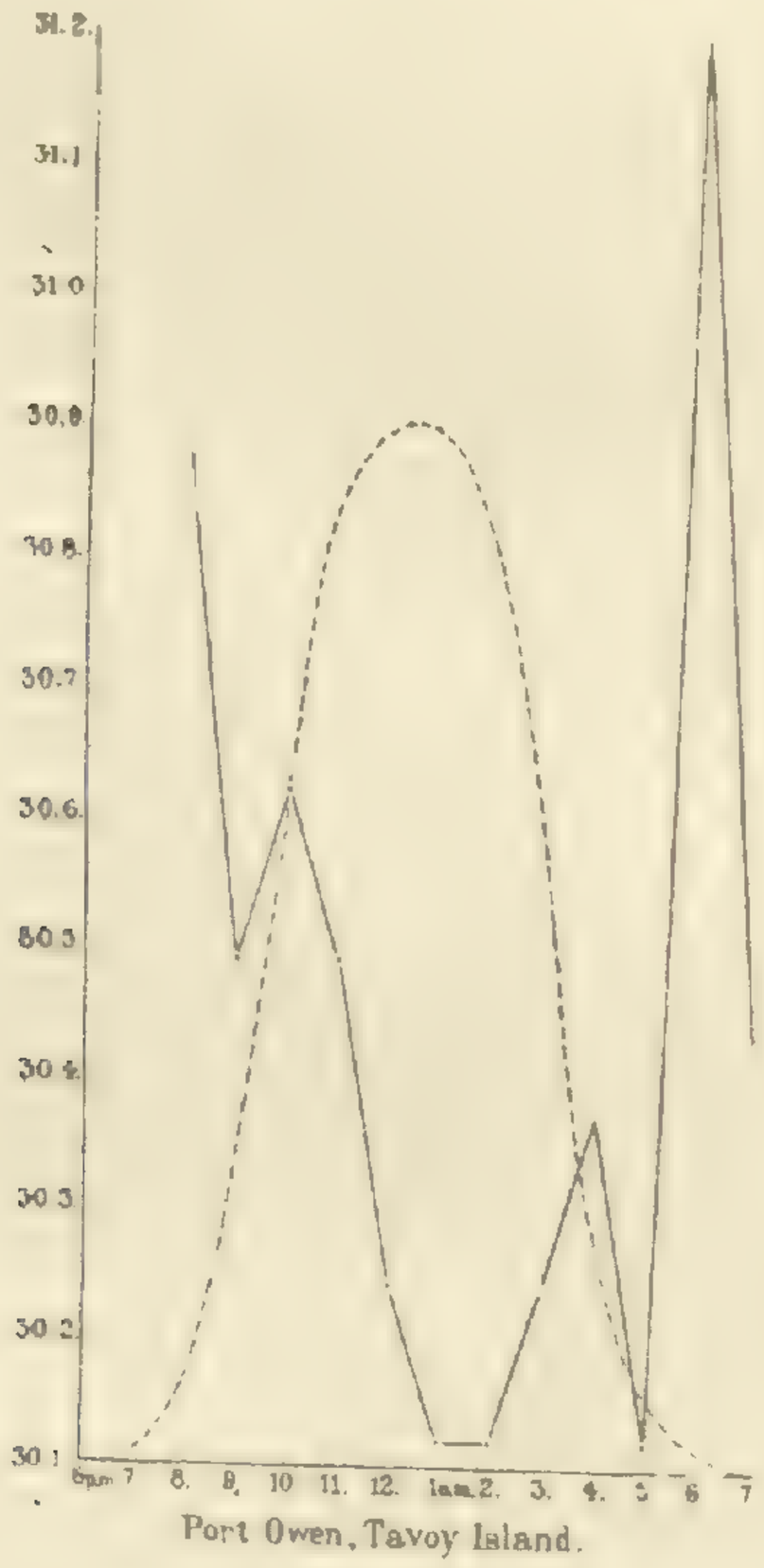


FIG. 6.

failure to obtain any definite results was due to the fact that the changes in salinity observed by him were too small.

In addition to this tidal variation it was found that the numbers of Copepoda frequenting the surface showed very considerable differences from day to day, as also did the total plankton obtained. As the investigations proceeded it was found that there was a decided tendency for the total plankton and the Copepoda to rise to a maximum and then fall to a minimum at intervals varying from five to fifteen days. These somewhat irregular variations do not appear to coincide either with the state of the tide (neaps and springs) or the phases of the moon, and at present I am unable to correlate them with

any alteration in the physical conditions present in the surroundings.

In addition the results show that there is also an annual variation in the numbers of these animals frequenting the surface : they are numerous during the months of November and December and then the numbers gradually diminish, so that at the beginning of February, they are comparatively small ; from this time on, however, they rapidly increase so that by the end of March and beginning of April, they are again present in large numbers. I am unfortunately unable to state what changes, if any, occur between April and November, as no observations have been made during this period.

During both seasons, daily observations were made on the surface temperature of these waters, and the results show that there is a very striking constancy in this respect : during the whole period covered by the observations, February to April 1911 and December 1911 to February 1912 the change in temperature never varied more than three degrees from 79° F. to 82° F., and in the vast majority of cases was between 80° and 81°.

STOMATOPODA.

Alima and *Erichthus larvae* were present throughout the whole period of investigation, but were most numerous about March. Examples of several different species were obtained.

BRACHIOPODA.—As I have previously pointed out (1912, p. 88) *Lingula* larvae occur in the tow-nettings from December to February. The specimens obtained during the season 1911-12 completely confirm the observations made during the previous year on the stages of formation and protrusion of the peduncle and the change of shape of the shell.

On two occasions at stations 417 and 445, I have been fortunate enough to obtain specimens of a *Discina* larva : their occurrence is of considerable interest, for hitherto no examples of *Discina* have been found, as far as I am aware, by the R.I.M.S. "Investigator," and further it shows that this species, like *Lingula anatina*, breeds in this region during the cold weather from December to January, thus differing apparently from the members of the same genus in other parts of the world, for F. Muller's original material from Desterro (Brazil) was obtained during the months of February to April, while Yatsu obtained a single specimen in Misaki Bay, Japan, between June and September.

Both the present examples were, as is usually the case, in the 4 p. c. stage.

ECHINODERMATA.—*Ophiopluteus* larvae were found to be of comparatively frequent occurrence at certain stations during the early part of the season, but as regards other members of the Phylum, larval forms were comparatively rare ; in this

respect, however, station 399 is worthy of note, for here the surface tow-netting contained, in addition to numerous *Ophiopluteus* larvae, several minute Asteroids just past the larval stage, a few small larval Echinoids, and several Holothurian larvae of the "barrel" type.

POLYCHAETA.—Polychaet larvae were of comparatively frequent occurrence throughout the whole period of investigation. Unfortunately in the present state of our knowledge it is impossible to identify specifically the various forms met with, and all that can be done is to refer them to their different families or genera. The families represented by their larvae in the collection are as follows :—

Alciopidae.
Disomidae.
Poecilochaetus, sp.
Magelonidae.
Nereidae.
Phyllodocidae
Polynoidae.
Spionidae.
Syllidae.
Terebellidae.
Tomopteridae.

At station 399, several long Polychaet worms of a pink colour were seen swimming on the surface near the ship. One of these was about 3 feet in length. Unfortunately I was only able to obtain a fragment, which, however, showed that it belonged to a species of Heteronereid.

While I was camped in Hinzé Basin, December 1910, I took advantage of the opportunity to make several collections of the Plankton both from the waters of the entrance channel and in the Basin itself.

The resulting catch was usually fairly copious and contained the following organisms :—

Pisces.—Fish ova and larval fish.
Tunicata.—Several examples of a species of *Salpa*.
Ascidian larvae.
Crustacea.—Larval Pagurid crabs.
Crab zoeae.
Crab megalopae.
Young Prawns in the post-larval stage.
Ostracoda.
Amphipoda. Several species; including examples of *Phronima*, sp.
Lucifer typus, auct.
Evadne, sp.
Copepoda (a list of the Gymnoplea has already been published).
Copepod nauplii.
Lepas nauplii.
Brachiopoda.—Several examples of *Lingula* larvae.
Mollusca.—Lamellibranch larvae.

Chaetognatha.—Examples of a species of *Sagitta* were common.
Polychaeta.—Numerous larval forms.
Coelenterata.—*Pleurobrachia* sp. were common.
Foraminifera.—Examples of *Globigerina* and *Polystomella.*
Radiolaria.—Examples of *Acanthometron*, sp.
Diatomacea—*Coscinodiscus.*
Chaetoceras.
Biddulphia.
Rhizosolenia.
Thalassiosira.

As regards the results obtained at stations 395 and 396, there is very little to say. The type of Plankton approximates very closely to that of the region to the west and south-west of the South Moscos Islands (Sewell, 1912 (b), area IV). It is of the same pink tinge and contains numerous Radiolaria and a few *Ceratium tripos.*

The surface tow-net at station 393 (7.21.06 N.: 85.07.15 E.) is of interest, in that, firstly, it serves as a control to the Mid-water Trawl taken at the same station, and secondly, it contained a species of Copepod that I have not hitherto obtained in the Bay of Bengal. The following Copepoda (Gymnoplea) were identified:—

Acrocalanus gracilis, Giesbr.
Acrocalanus longicornis, Giesbr.
Calanus minor (Cls).
Candacia aethiopica, Dana.
Candacia pachydactyla Dana.
Canthocalanus pauper (Giesbr.)
Centropages calaninus (Dana).
Centropages furcatus (Dana).
Clausocalanus arcuicornis (Dana).
Clausocalanus arcuicornis, var *plumulosus*, nov.
Eucalanus attenuatus (Dana).
Eucalanus crassus, Giesbr.
Labidocera minuta, Giesbr.
Paracalanus aculeatus, Giesbr.
Pontella securifer, Brady.
Pontellina plumata, Dana.
Temora discaudata, Giesbr.
Temora stylifera (Dana).
Undinula vulgaris (Dana).

This was the first occasion on which I had been fortunate enough to obtain examples of *Centropages calaninus.* In addition to the above there were numerous examples of *Oncœa* and *Sapphirina.*

Towards the close of the survey season 1911-12, the

R.I.M.S.S. "Investigator" proceeded to the Nicobar Islands in order to carry out a resurvey of Nankouri Harbour.

She arrived there on March 19th and remained there till April 10th. It is greatly to be regretted that during this period my assistant did not avail himself of the opportunity to make a collection of the fauna of the coral reef. The only specimens from this locality sent to Calcutta were three examples of *Julis lunaris* (Linn.) and an immature specimen of *Caranx armatus* (Forsk.), a single specimen of a large Holothurian, and four tow-nettings of the surface plankton.

As regards these latter, they do not appear to differ very materially from the plankton of the Burmese coast. In all four samples, the bulk of the catch consists of vegetable debris with a certain admixture of diatoms mainly *Rhizosolenia* and *Chaetoceras*, and a few examples of *Ceratium tripos*.

The chief animal constituents were:—

Ascidian tadpoles.
Crab Zoeae.
Copepoda.
Copepod nauplii.
Ostracoda
Balanus nauplii.
Balanus cyprides.
Pelagic Crustacean ova.
Lamellibranch larvae.
Sagitta sp.
Polychaet larvae.
Echinoderm larvae.

The Succession of Organisms in the Plankton.

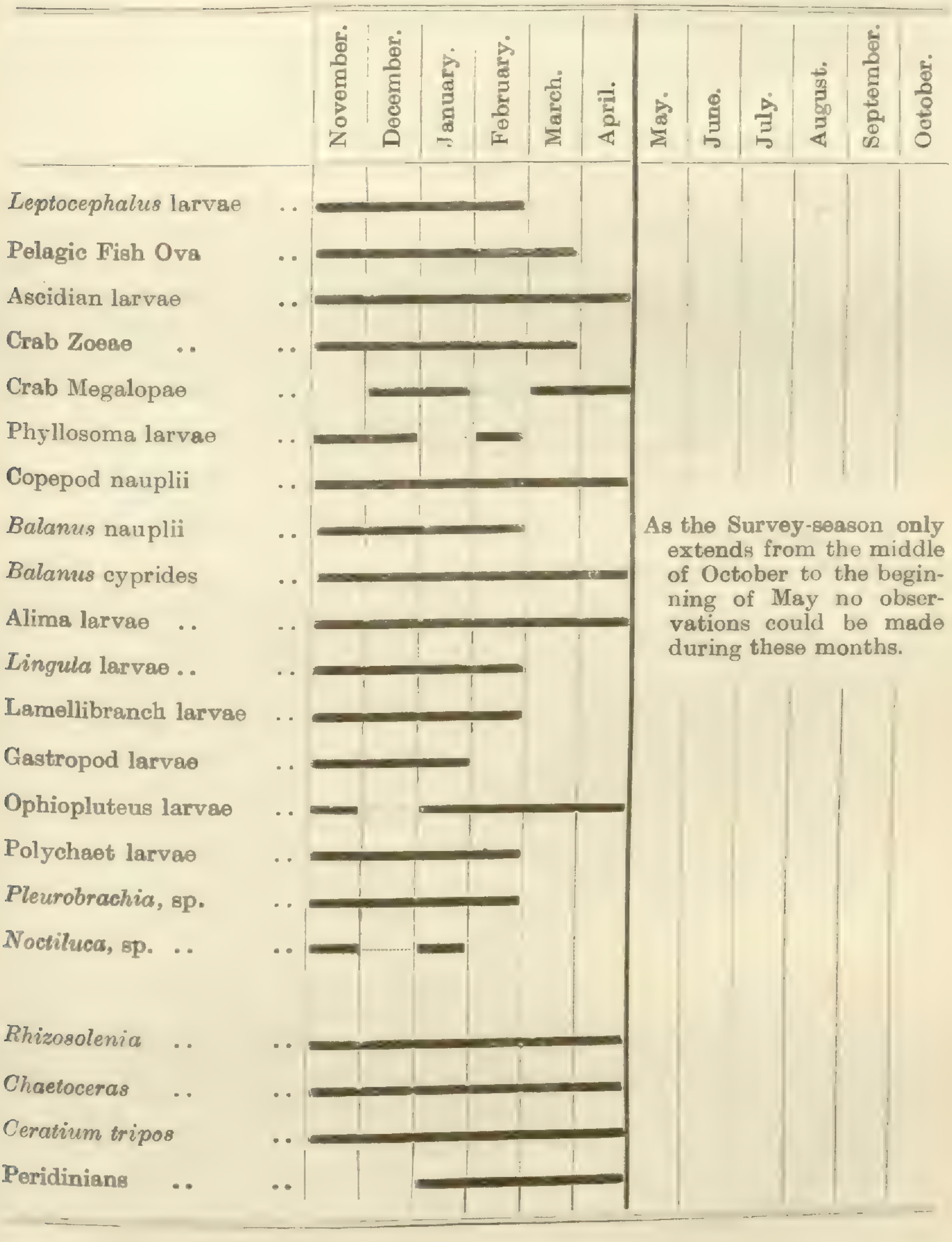
As the survey season only extends from the middle of October to the beginning of May, it has hitherto not been possible to make any observations on the constituents of the surface plankton during the period May to October, and moreover a period of two years is far too short to enable one with any degree of certainty to determine the periods at which any given organism will make its appearance in the surface collections, but, at the same time, as hitherto no observations have been made and we are at present completely ignorant with regard to the breeding seasons of most of the marine fauna, I have thought that the following notes may prove of interest.

In the accompanying Table I have given a list of the commoner forms of organism found in the Surface Plankton, and have indicated by thick lines the months during which they have been observed. As will be seen, in many cases they occur throughout the whole of the survey-season, so that one is not able to determine the limits of their period of occurrence; for instance, Crab Megalopae are found from December to April, and there can be no doubt that their season extends for a considerable further period, for although no observations could be made on the Burma coast, these larvae are found to swarm in enormous numbers in the Hoogly River during July and August.

THE SUCCESSION OF PLANKTONIC ORGANISMS.

Burma Coast.

Hinzé Basin to Tavoy Island.



As the Survey-season only extends from the middle of October to the beginning of May no observations could be made during these months.

As one would naturally expect, and as has been found to occur in other waters, different stages in the development of the same order of animals follow one another in a regular sequence: thus it is found that crab megalopae first make their appearance in December, at least one month after the crab zoeae, and are to be found for some considerable period of time after the zoeae have disappeared, and the same is the case with the *Balanus* nauplii and cyprides.

A comparison of the above table with that of the occurrence of similar organisms in the Plankton of the North Atlantic (Johnstone, 1908, p. 96, fig 23) shows that for the most part they occur in Indian waters at a somewhat later period, and there would appear to be a general tendency for marine organisms to have their breeding season during the cold weather rather than during the hot months; it is possible that this may be to a certain extent the result of the south-west monsoon and the consequent disturbance of the waters in this region.

In conclusion I should like to express my indebtedness to Dr. Annandale, the Superintendent of the Indian Museum, and to the officers of the Zoological Section. who have given me very considerable assistance in the identification of the various animals belonging to the groups in which they are interested, and to Capt. T. L. Bomford, I.M.S., who has kindly permitted me to include in the above report, his notes on the hauls made at stations 461—467, inclusive.

TABLE I.—*List of* Mollusca *obtained at various shore-collecting stations.*

	Hinzé Basin.	Coast.	Byikhwaaw Bay.	Moscos Islands.
LAMELLIBRANCHIA.				
LIPOCEPHALA.				
Monomya.				
Ariculacea.				
Meleagrina margaritifera, Linn. ..	..	..	×	..
Pina nigra, Ch.	..	..	×	..
Ostracea.				
Ammussium pleuronectes, Linn. ..	..	×	..	..
Ostrea cucullata, Born.	×	..	×	×
Pecten cra-sicostatus, Sow. ..	..	..	×	..
Pecten, sp.	×	..	..	×
Spondylus, sp.	..	..	..	×
Heteromya.				
Mytilacea.				
Mytilus viridis, Linn.	×	..	..	..
Mytilus, sp.	..	..	×	×
Isomya.				
Pholadacea.				
Aspergillum, sp.	..	..	×	..
Martesia multistriata, Sow. ..	×	..	×	..
Pholas orientalis, Gm.	×	..	..	..
Myacea.				
Glauconomya angulata, Rv. ..	..	..	..	×
Siliqua radiata, Linn.	×	..	×	..
Solen brevis, Gray.	..	..	×	..
Veneracea.				
Circe castrensis, Linn.	..	..	×	×
Circe, sp.	..	×	..	×
Clione tiara, Wood.	..	..	×	..
Crista dispar, Ch.	..	..	×	..
Crista divaricata, Ch.	×	..	×	..
Cytharea castanea, Lam. ..	×	..	..	..

TABLE I.—(*Continued.*)

	Hinzé Basin.	Coast.	Byikhwaaw Bay.	Moscos Islands.
Veneracea.—*contd.*				
Cytharea erycina, Linn	..	..	..	× × ×
Cytharea, sp.	..	..	..	×
Donax cuneatus, Linn.	×	×	× : :	×
Donax dysoni. D.	..	..	×	..
Donax scortum, Linn.	×	..	..	..
Dosinia fibula, Rv.	×	×	..	..
Hiatula acuminata, D.	..	..	×	..
Mactra adansoni, Phil.	×	..	..	..
Mactra luzonica, D.	..	..	×	..
Mactrinula plicataria, Linn. ..	×	..	..	..
Meroe picta, Linn.	×	..	..	..
Paphia glabrata, Lam.	..	..	..	×
Pullastra cor, Sow.	×	..	..	..
Tapes marmorata. Lam. ..	×	..	..	..
Tapes textrix, Linn.	..	×	×	..
Tellina angulata, Ch.	×	..	..	..
Tellina lacunosa, Ch.	×	..	..	..
Tellina virgata, Linn.	..	..	×	..
Tellinoides sinuata, Sp.	×	..	..	..
Cardiacea.				
Cardium asiaticum Brg.	×	×	..	..
Cardium dupuchense Rv. ..	..	..	..	×
Cardium retusum, Linn.	..	..	×	..
Cardium, sp.	×	..	..	..
Chama multisquamosa, Rv. ..	..	×	..	×
Chama, sp.	..	..	×	..
Fragum unedo, Linn.	..	..	..	×
Laevicardium australe, Sow. ..	..	..	×	..
Trachycardium flavum, Linn. ..	..	..	×	..
Tridachna rudis, Pr.	..	..	..	×
Lucinacea.				
Cardita distorta, Rüpp.	..	..	..	×
Arcacea.				
Anomalocardia crenata, Rv. ..	..	×	..	..
Anomalocardia oblonga, Phil. ..	..	..	×	..
Anomalocardia scapha. Ch. ..	×	..	..	..
Barbatia decussata, Sow. ..	..	..	..	×
Barbatia velata, Sow.	..	..	×	..
Scapharca disparilis. Rv. ..	×	..	..	..
Scapharca gubernaculum, Rv. ..	×	..	..	..
Scapharca japonica, Rv.	×	..	..	..

TABLE I.—(*Continued.*)

	Hinzé Basin.	Coast.	Byikhwaaw Bay.	Moscos Islands.
GASTROPODA.				
Opisthobranchia.				
Bullidae.				
Bulla ampulla, Linn.	..	×	×	×
Azygobranchia.				
Volutidae.				
Melo indica, Gmelin.	..	..	×	×
Olividae.				
Oliva gibbosa, Born.	×	..	×	..
Oliva maura, Lam.	..	..	..	×
Oliva tremulina, Lam.	..	..	×	..
Oliva, sp.	..	×	..	..
Utriculina nebulosa, Lam.	..	..	×	..
Utriculina, sp.	..	..	..	×
Mitridae.				
Nebularia, sp.	..	..	×	..
Buccinidae.				
Eburna canaliculata, Schum. ..	×	..	×	×
Muricidae.				
Fusus colus, Linn.	..	×	..	..
Fusus, sp.	..	×	..	..
Hemifusus pugillinus ..	..	..	..	..
Murex martinianus, Rv.	..	×	..	..
Murex tenuispina, Lam.	..	..	×	..
Purpura bituberculata, Lam.	..	×	..	..
Purpura bufo, Lam. ..	..	×	..	..
Purpura persica, Linn. ..	..	..	..	×
Rapane bulbosa, Soland.	..	..	×	..
Cancellaridae.				
Cancellaria elegans, Sowb. ..	..	×	..	..
Conidae.				
Chelyconus terminus, Rv.	..	..	×	..
Chelyconus, sp. ..	..	×	×	..

TABLE I.—(*Continued.*)

	Hinzé Basin.	Coast.	Byi hwaaw Bay.	Moscos Islands.
Conidae.—*contd.*				
Conus angulatus, A. Ad... ..	..	×	..	..
Dendroconus betulinus, Linn. ..	..	..	×	..
Lithoconus tesselatus, Born. ..	..	..	..	×
Rhizoconus monile, Hw. ..	..	..	×	..
Cypraridae.				
Aricia, sp.	..	..	×	..
Cypraea, sp.	×	..	..	×
Luponia lamarckii, Duch. ..	..	..	×	..
Tritonidae.				
Persona cancellina, Desh. ..	..	..	×	..
Ranella tuberculata, Brod. ..	×	..	..	..
Ranella, sp.	..	×	×	..
Doliidae.				
Dolium tesselatum, Lam. ..	×	×	..	..
Ficula dussumieri, Val.	×	..	×	..
Cassis glauca, Linn.	×	×	..	..
Strombidae.				
Pteroceras lambis, Linn. ..	..	..	..	×
Strombus marginatus, Linn. ..	..	×	×	×
Strombus urceus, Linn.	..	..	×	..
Capulidae.				
Crepidula, sp.	×	..	..	..
Crucibulum extinctorum, Lam. ..	×	..	..	..
Crucibulum morbidum, Rv. ..	×	..	..	..
Naticidae.				
Mamma mamilla, Linn.	×	..	×	..
Natica lineata, Chem.	×	..	..	..
Natica pellistigrina, Ch. ..	×	..	..	..
Naticina papilla, Gm.	×	..	..	..
Neverita, sp.	..	..	×	×
Sigaretus neritoides, Linn. ..	×	..	×	..
Turritellidae.				
Turritella attenuata, Rv. ..	×	×	..	..
Turritella duplicata, Lam. ..	×	..	..	..
Turritella terebra, Linn. ..	..	×	..	..

TABLE I.—(*Concluded.*)

	Hinzé Basin.	Coast.	Byikhwaaw Bay.	Moscos Islands.
Cerithidae.				
Cerithium morus, Lam.	..	..	×	..
Cerithium, sp.	×	..	..	×
Vertagus sinensis, Gm.	..	..	..	×
Neritidae.				
Dostia cornucopiae, Bens. ..	×	..	..	..
Nerita chamaeleon, Linn. ..	×	..	..	..
Nerita costata, Ch.	..	..	×	×
Nerita lineata, Linn.	×	..	..	..
Trochidae.				
Lunella porphyritis, Mart. ..	..	..	×	×
Monodonta australis, Lam. ..	..	..	..	×
Polyodonta regius, Ch.	..	..	×	..
Polyodonta rugulosa, Koch. ..	..	..	..	×
Polyodonta, sp.	..	..	..	×
Rotella vestiaria, Linn. ..	×	..	..	×
Senectus cochleus, Linn. ..	..	..	×	..
Senectus radiatus, Gm.	..	..	×	×
Trochus niloticus, Linn.	..	..	..	×
Turbo margaritaceus, Linn. ..	..	..	×	×
Turbo marmoratus, Linn.	..	..	..	×
Patellidae.				
Patella, sp.	..	..	..	×
Fissurellidae.				
Fissurella bombayann, Sow. ..	×	..	..	..
CEPHALOPODA.				
Argonauta, sp.	..	..	×	..
Nautilus pompilius, Linn. ..	..	..	..	×
Sepia aculeata, Van Hass. ..	×	..	×	×
Sepiella inermis Van Hass. ..	..	..	..	×
Spirula	..	..	×	×

TABLE II.—*Showing the occurrence of organisms in*

Survey Season, 1910-11.

	Za	Zb	Zc	Zd	Ze	Zf	Zg	Zh	Zj	Zk	Zl	Zm	Zn	Zo	Zp
Hydrophis fasciatus	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..
Caranx carangus	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..
Caranx hippos	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..
Caranx kalla	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..
Citharichthys, sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Coila dussumieri	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..
Corica soborna	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Engraulis, sp.	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..
Equula runconius	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..
Equula, sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Glyphidodon, sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Harpodon nehereus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Hemiramphus cantori	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..
Hemiramphus xanthopterus	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..
Hemiramphus, sp.	..	..	..	×	..	..	..	..	×	..	..	..	..	..	..
Hippocampus, sp.	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..
Leptocephalus, sp.	..	..	..	..	..	..	..	..	..	×	×	×	×	..	..
Monacanthus, sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pleuronectid larva	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Trichiurus savala	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Xenopterus naritus	..	×	×	..	..	×	..	..	..	×	..	..	..	×	..
Salpa cylindrica	..	..	..	..	..	..	×	×	..	..	×	×	×	..	×
Charybdis (Goniosoma) affinis	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..
Charybdis (Goniosoma) crucifera	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..
Charybdis (Goniosoma) merguiensis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Charybdis (Goniosoma) rostrata	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..
Dorripe astuta	..	..	..	..	..	×	..	..	×	..	..	..	..	×	..
Neptunus, sp.	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..
Varuna litterata	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..
Leander, sp.	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..
Ascetes indicus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Phyllosoma larva	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Phronima, sp.	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..
Alima larva	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..
Limulus moluccanus	..	×	..	..	×	..	..	×	×	×	×	×	×	×	×
Medusae, sp.	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..
Cephea, sp.	..	..	..	..	..	..	×	..	×	×	..	..	×	×	×
Irene ceylonense	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Octocanna polynema	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Siphonophora, sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pleurobrachia, sp.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Porpita, sp	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..

the Plankton obtained with the large surface tow-net.

Survey Season, 1911-12.

Zq	A	D	E	F	G	H	J	K	L	M	Q	T	V	X	An	394	401	402	403	404	405	406	415	417	443
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	×	..	×	..	..	×	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	×	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	×	..	..	..	..	..	..	×	×	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..
..	×	..	..	×	×	×	×	×	..	×	×	×	×	×	×	..	×	×	×	×	×	×	×	..	..
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..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

TABLE III.—*Occurrence of organisms in the*

Survey-Sea

	394	395	396	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
Pelagic Fish ova	..	..	..	..	×	..	..	..	..	..	..	..	..	×	..	..	×	..	..	..	..	..	×	×	×	..
Ascidian larvae	..	..	×	×	×	×	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	×	×	..	..
Crab zoea ..	..	..	..	×	..	×	..	..	..	..	..	×	..	..	..	×	..	..	..	..	..	..	×	..	..	×
Crab megalopa	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..
Copepoda ..	..	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	..	×	×	×	×	×	×
Copepod nauplii	..	..	×	×	×	×	..	..	..	..	..	..	×	..	×	..	×	..	×	..	..	×	×	×	×	×
Ostracoda ..	..	..	×	..	×	×	..	..	..	×	..	..	×	×	..	×	×	×	×	..	..	..	×	×	..	×
Balanus nauplii	..	..	..	..	×	×	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	×	..	×	..	..
Balanus cyprides	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	×	..	×	..	..	×	..	×	×	..	..
Evadne, sp. ..	..	..	..	..	×	×	..	..	..	..	..	..	×	×	..	×	×	..	..	..	×	..	×	×	×	..
Lingula larvae	..	..	..	..	×	..	..	..	×	..	..	..	..	..	×	×	×	..	..	..	×	×	×	..	..	..
Lamellibranch larvae	..	..	..	..	×	×	..	..	×	..	..	..	..	..	×	×	..	..	..	..	×	..	×	×	×	×
Gastropod larvae	..	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	×	×	×
Ophioplutens larvae	..	..	..	..	..	×	×	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sagitta, sp. ..	..	..	×	..	×	×	..	..	..	..	..	×	..	×	×	×	×	×	..	..	..	..	×	×	×	×
Polychaet larvae	..	..	..	×	..	×	×	..	..	..	..	..	..	×	..	×	×	..	..	..	..	..	..	×	×	..	..
Noctiluca, sp...	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Plankton obtained by small surface tow-net.

son, 1911-12.

421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456
.	.	.	.	×	.	.	.	.	.	.	.	×	.	.	.	.	.	.	.	×	.	.	×	×	.	×	.	.	.	×	.	.	.	×	×
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TABLE IV.—*Record of tow-nettings from ship during day-time.*

Month. (1911)	Date.	State of Tide.	Position from		Position to		Copepod catch per hour.
			N.	E.	N.	E.	
Da	February	3	?	West of Middle Moscos Islands.			1386
Db	,,	7	?	13.45	97.57	13.45	97.55	296
Dc	,,	8 (*a*)	Late ebb ..	13.55	97.56½	14 15½	97.56½	472·5
Dd		(*b*)	Flood and H W.	14.15½	97.56½	14.13	97.55½	97·25
De	,,	9 (*a*)	Ebb	14.13	97.55½	14.10½	97.57½	143·5
Df		(*b*)	Early flood					60·5
Dg	,,	10 (*a*)	High water	14.10½	97.57½	14.00	98·00	22·6
Dh		(*b*)	Low water					37·0
Di	,,	13	Late ebb ..	13.41	97.56½	13.43	98·00	156·25
Dk	,,	15 (*a*)	Flood ..	13.52½	97.59½	13.50	97.59½	644
Dl		(*b*)	Ebb ..	13.50	97.59½	13.45	97.55	1012
Dm	,,	16 (*a*)	Late flood ..	13.47	97.51½	13.49	97.51½	363·6
Dn		(*b*)	Ebb ..	13.54	97.51	13.54	97.54	552
Do	,,	17 (*a*)	Late flood ..	13.55½	97.57½	13.54½	98.1	141
Dp		(*b*)	Early ebb ..	13.54	98.0¾	13.51½	98.2	237
Dq		18	Flood ..	13.48	97.57	13·47½	97.59½	275
Dr	March ..	2 (*a*)	Late flood ..	14.4½	97.51½	14.3½	98.00	775
Ds		(*b*)	Ebb ..	14.2	97.52	14.1½	97.53½	1250
Dt	,, ..	3 (*a*)	Late flood ..	14.0½	97.50½	14.0½	97.51¾	100
Du		(*b*)	Ebb ..	13.59½	97.57¼	..	..	558·3
Dv	,, ..	14 (*a*)	Early ebb ..	13.34½	97.45	13.34	97.40½	156
Dw		(*b*)	Late ebb ..	13.34	97.46	13.34	98.2¼	512·5
Dx	,, ..	16 (*a*)	Flood ..	13.39½	97.55	13.41	98.2½	400
Dy		(*b*)	Ebb ..	13.41½	97.52	13.42	98.2	1000
Dz	,, ..	17 (*a*)	Flood ..	13.38½	97.52	13.38½	97.42¾	175
Ea		(*b*)	Ebb ..	13.39½	97.48½	13.40	98.5	800

TABLE IV.—(*Concluded*).

	Month. (1911)	Date.	State of Tide.	Position from		Position to		Copepod catch per hour.
				N.	E.	N.	E.	
Eb	March ..	18 (*a*)	Early flood..	13. 37¾	98. 0½	13. 37¾	97. 58	1800
Ec		(*b*)	Late ebb ..	13. 36¾	97. 54¾	13. 36¾	97. 55¾	600
Ed	,, ..	20	Flood ..	13. 31¾	98. 3¼	13. 34	97. 54	312
Ee	,, ..	21	,, ..	14. 7½	97. 37¾	..	..	..
Ef	,, ..	29 (*a*)	High water..	13. 57	97. 42	13. 56	97. 48	240
Eg		(*b*)	Late ebb ..	13 55½	97. 48¾	13. 54	97. 41¼	336
Eh	,, ..	30 (*a*)	High water..	13. 52¾	97. 40	13. 52	97. 50	250
Ei		(*b*)	Late ebb ..	13 51¼	97. 46	13. 50¼	97. 47½	300
Ek	,, ..	31 (*a*)	Late flood ..	13. 49	97. 40	13· 48½	97. 50	362·5
El		(*b*)	Ebb ..	13. 47	97. 46¼	13 46	97. 43¼	275
Em	April ..	1	High water..	13. 45	97. 47	13. 44½	97. 54	862·5
En	,, ..	3 (*a*)	Late flood ..	13. 45½	97. 52½	13 46½	97. 46	212·5
Eo		(*b*)	Early ebb ..	13. 47	97. 49¼	13. 49	97. 49¾	825
Ep	,, ..	4 (*a*)	Late flood ..	13. 52¼	97 52¼	13· 53¾	97. 47¼	600
Eq		(*b*)	Ebb ..	13. 59	97. 47	14 ..	97. 46½	616·6
Er	,, ..	5 (*a*)	Early flood..	14. 2	97. 42	14. 3	97. 40¾	1850
Es		(*b*)	Flood ..	14. 3	97. 40¾	14. 3	97. 46¼	1150
Et		(*c*)	Late flood ..	14. 2½	97. 46½	14. 4¼	97. 41¾	350
Eu		(*d*)	High water..	14. 4½	97. 47	14. 4½	97. 44½	475
Ev		(*e*)	Ebb ..	14. 4½	97. 39	14. 5½	97. 41½	975
Ew	,, ..	6 (*a*)	Low water ..	14. 3¾	97. 41¼	14. 4	97. 45¼	1323
Ex		(*b*)	Early flood..	14. 4½	97. 45¼	14. 4½	97. 43¾	400
Ey		(*c*)	Late flood ..	14. 4½	97. 41	14. 5½	97. 44½	275
Ez		(*d*)	High water..	14. 5½	97. 45	14. 3¾	97. 47	625
Fa		(*e*)	Ebb ..	13. 58¾	97. 59	13. 58	97. 57½	825

TABLE V.—*Record of Tow-nettings from Steam Cutter in Inshore waters by day.*

	Date.	Times of High and Low Water.				Time of Towing.		State of Tide.	State of Wind.		Position from		Position to	
											Lat. N.	Long. E.	Lat. N.	Long. E.
Ya	February 14 (*a*)	5-40 L.	11-30 H.	5-40 L.	11-45 H.	10 a.m.	3-30 p.m.	Late flood and early ebb.	N. to W.	1	13. 47¼	98. 4	13. 51	98. 4½
Yb	(*b*)					4-30 p.m.	5-30 p.m.	Late ebb ..	W.	2	13. 51	98. 4½	13. 52½	97. 59½
Yc	21 (*a*)	2-25 H.	8-20 L.	2-40 H.	9-20 L.	9-45 a.m.	1 p.m.	Flood ..	SSE.	2	13. 56	97. 53½	13. 57	98. 0
Yd	(*b*)					3 p.m.	4-30 p.m.	Early ebb ..	WNW.	2				
Ye	March 2 (*a*)	5-45 L.	12-0 H.	6-0 L.	..	..	..	Flood ..	NE.	2	14. 6½	98. 5½	14. 6	98. 1¾
Yf	(*b*)					..	..	Ebb ..	NWW.	2	14. 5½	98. 4½	14. 5	98. 0
Yg	8	2-30 H.	8-30 L.	3-5 H.	9-40 L.	..	..	..	W.	1-2	13. 45	98. 4	13. 43	98. 0
Yh	10	..	..	..	..	12-30	3-30	Flood ..	..	..	13. 45	98. 4½	13. 47	98. 4

TABLE VI.—*Surface tow-net stations for large surface tow-net.*
1910-11. *Night.*

Station.	Date.	Position.
Zc	16/17-12-10 ..	14° 43′ 25″ N. : 97° 48′ E.
Zd	17/18-12-10 ..	14° 43′ 25″ N. : 97° 48′ E.
Ze	18/19-12-10 ..	14° 43′ 25″ N. : 97° 48′ E.
Zf	19/20-12-10 ..	14° 36′ N. : 97° 45′ E.
Zg	3/4-1-11 ..	14° 26′ 30″ N. : 97° 52′ E.
Zn	4/5-1-11 ..	14° 22′ 30″ N. : 97° 52′ E.
Zi	5/6-1-11 ..	14° 36′ N. : 97° 49′ 30″ E.
Zl	16/17-1-11 ..	14° 19′ 10″ N. : 97° 56′ 35″ E.
Zm	18/19-1-11 ..	14° 22′ 30″ N. : 97° 43′ E.
Zn	19-20-1-11 ..	14° 27′ N. : 97° 44′ E.
Zp	28/29-1-11 ..	14° 24′ 15″ N. : 97° 47′ 15″ E.
Zq	31/1-1-11 ..	14° 6′ N. : 97° 45′ 30″ E.

TABLE VII.—*List of surface-collecting stations. Night—both large and small nets.*

Station.	Date.	Position.		Surface Temp. Fahr.	Hydrometer reading.
		N.	E.		
A	1/2-2-11 ..	14.10	97.50	81	..
B	2/3-2-11 ..	14.7	97.48	82	1022·5
C	3/4-2-11 ..	14.10	97.46	81	1022
D	4/5-2-11 ..	13.33	98.8½	80	1022
E	5/6-2-11 ..	13.33	98.8½	80	1022
F	6/7-2-11 ..	13.45	97.55	80	1022
G	7/8-2-11 ..	13.55	97.56½	80·5	1022
H	8/9-2-11 ..	14.13	97.56	80	1022·5
I	9/10-2-11 ..	14.10½	97.57½	79	1023
K	10/11-2-11 ..	14.0	98.0	80	1023
L	11/12 2-11 ..	13.33	98.8½	80	1023
M	12/13-2-11 ..	13.33	98 8½	80·5	1023
N	13/14-2-11 ..	13.43	98.0	80	1023
O	14 15-2-11 ..	13.52½	97.59½	81	1023
P	15/16-2-11 ..	13.45	97.55	81	1023
Q	16/17-2-11 ..	13.57½	97.55	80	1022·5
R	17 18-2-11 ..	13.48	97.57	81	1023
S	18 19-2-11 ..	13.33	98.8½	81	1023
T	19/20-2-11 ..	13.33	98.8½	80·5	1023
U	20/21-2-11 ..	13.47	98.0	80	1023
V	21/22-2-11 ..	13.52	97.59½	80·5	1023
W	1/2-3-11 ..	14.4½	97.58	80	1023·5
X	2/3-3-11 ..	14.5	98.0	80	1023
Y	3/4-3-11 ..	13.58½	98.1	80	1023
Z	4/5-3-11 ..	13.33	98.8½	80·5	1023

TABLE VII.—(*Concluded.*)

Station.	Date.	Position.		Surface Temp. Fahr.	Hydrometer reading.
		N.	E.		
Aa	5/6-3-11 ..	13.33	98.8½	80	1023
Ab	6/7-3-11 ..	13.58	98.1¼	80	1023·5
Ac	7/8-3-11 ..	13.46½	98.2½	81	1023
Ad	8/9-3-11 ..	13.45½	98.2	80	1023
Ae	9/10-3-11 ..	13.42	98.2½	80	1023
Af	10/11-3-11 ..	13.39½	98.3	80·5	1023
Ag	11/12-3-11 ..	13.33	98.8½	81	1023
Ah	12/13-3-11 ..	13.33	98.8½	80	1023
Aj	13/14-3-11 ..	13.34½	98.3½	81	1022
Ak	14/15-3-11 ..	13.36	98.3	81	1022
Al	15/16-3-11 ..	13.38¼	98.2½	80	1023
Am	16/17-3-11 ..	13.38¾	98.7¼	81	1023
An	17/18-3-11 ..	13.39¾	98.4½	81	1023
Ao	18/19-3-11 ..	13.33	98.8½	81	1023
Ap	19/20-3-11 ..	13.33	98.8¼	82	1023
Aq	20/21-3-11 ..	13.39	97.56	82	1023
Ar	28/29-3-11 ..	13.55	97.51	82	1023
As	29/30-3-11 ..	13.54	97.52	82	1023
At	30/31-3-11 ..	13.50	97.52	82	1022
Au	31/1-4-11 ..	13.45	97.43	82	1022
Av	1/2-4-11 ..	13.33	98.8½	80	1022
Aw	2/3-4-11 ..	13.33	98.8½	81	1022
Ax	3 4-4-11 ..	13.51	97.51¾	82	1022
Ay	4/5-4-11 ..	14.1¼	97.49¼	81	1022
Az	5/6-4-11 ..	14.2¼	97.45	82	1022
Ba	6/7-4-11 ..	13.56¼	98.0	82	1022

Table VIII.—*Surface collecting stations*, 1911-12.

Station No.	Date.	Position.		Sounding.	Temp. Fahr.	Hydrometer reading.	Total Plankton ccs.
		N.	E.				
394	1 & 3-11-11 ..	16. 16. 00	96. 21. 00	6 fms.	80	1002	..
397	9/10-11-11 ..	18. 7. 40	98. 17. 45	6 fms.	80	1020 5	..
398	10/11-11-11 ..	13. 07	98. 19	9	81	1020	21
	11 12-11-11 ..	ditto	ditto	9	81	1020	22
	12/13-11-11 ..	ditto	ditto	9	81	1020	32
399	13/14-11-11 ..	13. 25	98. 23	..	80	1019·5	5
400	14-11-11 ..	13. 20½	98. 23. 45	8 fms.	..	..	..*
401	14/15-11-11 ..	13. 16	98. 26	..	81	1020	1
402	15/16-11-11 ..	13. 02	98. 25	5	82	1020	3
403	16/17-11-11 ..	13. 20	98. 23	6	82	1019·5	1
404	17/18-11-11 ..	13. 6½	98. 19½	12½	83	1020·5	1
405	18/19-11-11 ..	13. 06	98. 20	12½	80	1020·5	35
406	19/20-11-11 ..	13. 06	98. 20	12½	80·5	1020·5	120
407	20/21-11-11 ..	13. 17½	98. 22	9	81	1020	2
408	21/22-11-11 ..	13. 22	98. 21	9·4 ft.	81	1020·5	2·5
409	22/23-11-11 ..	13. 25	98. 20	..	82	1020	1
410	23/24-11-11 ..	13. 27½	98. 15	7·5 ft.	81	1020	15
411	24/25-11-11 ..	13. 28	98. 18	6·4 ft.	81	1021	3
412	25/26-11-11 ..	13. 6½	98. 19½	8·2 ft.	81	1020	72
413	26/27-11-11 ..	13. 6½	98. 19½	8·2 ft.	..	1020·5	3
415	27/28-11-11 ..	13. 6½	98. 19½	8·2 ft.	81	1020	3
416	28 29-11-11 ..	13. 6½	98. 19½	8·2 ft.	82	1021·5	..
417	7/8-12-11 ..	13. 29	98. 12	9·4 ft.	..	1019	19
418	8/9-12-11 ..	13. 25	98. 18	9.5 ft.	81	1020	12

* Taken from ship while sounding.

TABLE VIII.—(*Continued.*)

Station No.	Date.	Position.		Sounding.	Temp. Fahr.	Hydrometer reading.	Total Plankton ccs.
		N.	E.				
419	9/10-12-11 ..	13. 6½	98. 19½	8·3 ft	80·5	1019	11
420	10/11-12-11 ..	13. 6½	98. 19½	8·3 ft.	81	1019	15·5
421	11/12-12-11 ..	13. 33	98. 9	4·5 ft.	81	1019	2
422	12/13-12-11 ..	13. 33	98. 9	4·5 ft.	81	1018	18
423	13/14-12-11 ..	13. 18	98. 23	4·4 ft.	82	1020	1·5
424	14/15-12-11 ..	13. 17½	98. 22	4·4 ft.	81	1019	0·5
425	15/16-12-11 ..	13. 14½	98. 21½	8·3 ft.	81	1020	4
426	16/17-12-11 ..	13. 13	98. 23	5·5 ft.	81	1019	4
427	17/18-12-11 ..	13. 13	98. 23	5·5 ft.	81 5	1019	17
428	18/19-12-11 ..	13. 05½	98. 23	7·4 ft.	81	1020	1
429	19/20-12-11 ..	13. 06	98. 22½	7·3 ft.	81	1019·5	4
430	30/31-12-11 ..	13. 06½	98 19	6·5 ft.	80	1019	105
431	31/1-1-12 ..	13. 06½	98. 19	6 5 ft.	..	1020	200
432	1/2-1-12 ..	13. 06½	98. 19	6·5 ft.	80	1020	33
433	2/3-1-12 ..	13. 07½	98. 12	17·2 ft.	79	1020	18
434	3/4-1-12 ..	13. 02	98. 14	17·1 ft.	79	1019	58
435	4/5-1-12 ..	13. 08½	98. 12	16	80	1020	11·5
436	5/6-1-12 ..	13. 14½	98. 15	29	81	1020	14(+)
437	6/7-1-12 ..	13. 06	98. 18	15	80	1019·5	5
438	7/8-1-12 ..	13. 06	98. 18	15	80	1019	17
439	8/9-1-12 ..	12. 56	98. 13	17·4 ft.	79	1018·5	10
440	9/10-1-12 ..	12. 55	98. 13½	16·2 ft.	79	1018	7
441	10/11-1-12 ..	12. 53	98. 15½	15·2 ft.	79	1018	12·5
442	12/13-1-12 ..	12. 55	98. 22	15	79	1018	7
443	15/16-1-12 ..	13. 00½	98. 22½	7·1 ft.	79	1018	3
444	17/18-1-12 ..	13. 06½	98. 18½	6	80	1019	3·5

TABLE VIII.—(*Concluded.*)

Station No.	Date.	Position.		Sounding.	Temp. Fahr.	Hydrometer reading.	Total Plankton ccs.
		N.	E.				
445	26/27-1-12 ..	12. 49. 30	98. 22. 45	30	80	1020	15
446	27/28-1-12 ..	13. 06. 30	98. 18. 45	6	80	1020	2·5
447	28/29-1-12 ..	13. 06. 30	98. 18 45	6	80	1020	13
448	29/30-1-12 ..	13. 03. 45	98. 31. 10	4	80·5	1020	1·25
449	31/31-1-12 ..	12. 57. 30	98. 31. 30	4·3 ft.	80	1020	9
450	31/1-2 12 ..	12. 57. 30	98. 31. 30	4·3 ft.	80	1020	12
451	1/2-2-12 ..	12. 57	98. 24. 00	13·1 ft.	80	1020	20
452	2/3-2-12 ..	12. 57	98. 24	13·1 ft.	80	1019	15
453	7/8-2-12 ..	12. 47. 30	98. 24. 45	6·4 ft.	80	1019	30
454	....	..	..	..	80	1019	..
455	....	..	..	..	80	1019	..
456	....	..	..	..	80	1019	..

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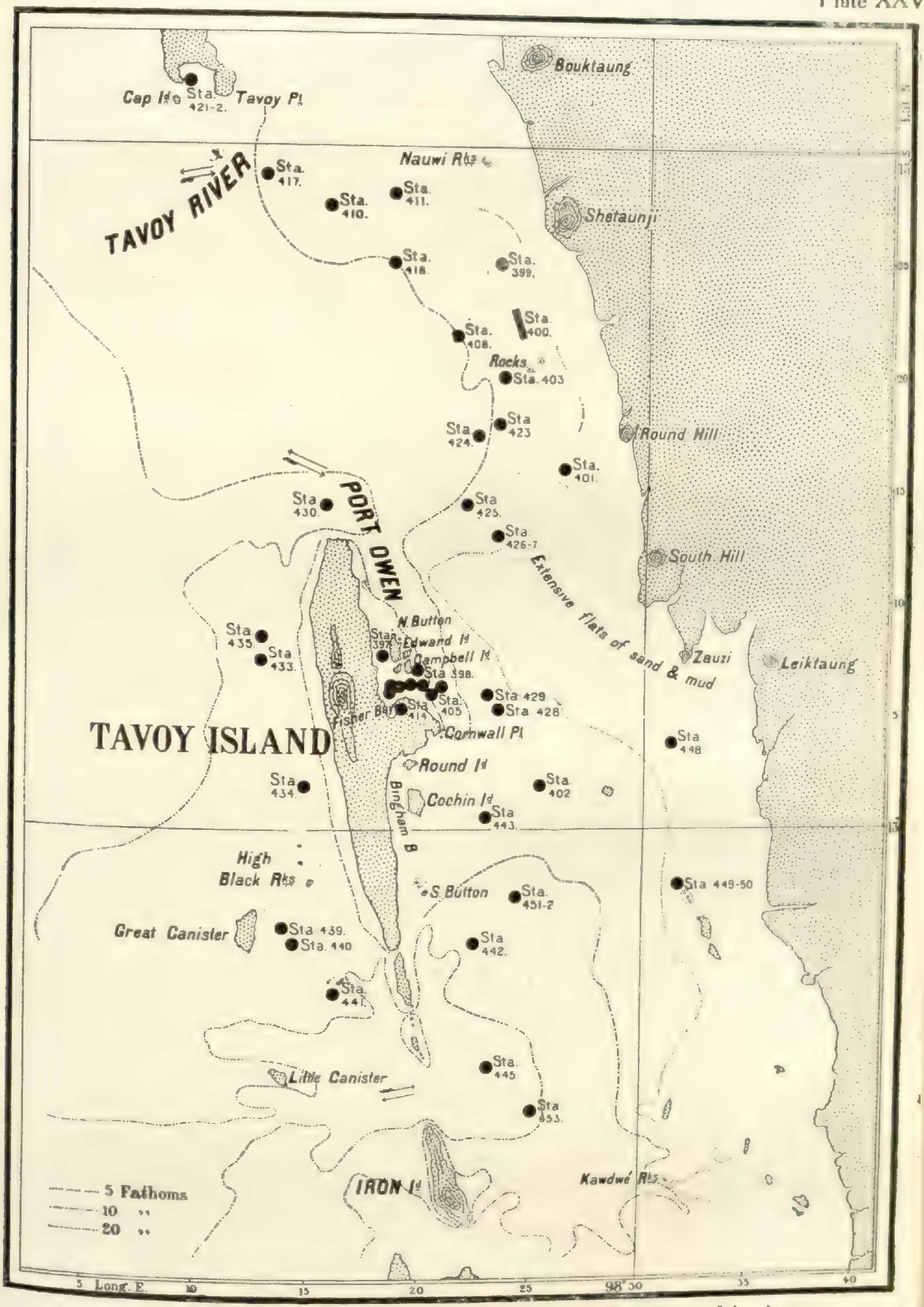

Chart of the Burma Coast in the Neighbourhood of Tavoy Island.

44. The Limestone Caves of Burma and the Malay Peninsula.*

By N. Annandale, D.Sc., F.A.S.B.; J. Coggin Brown, M.Sc., F.G.S.; and F. H. Gravely, M.Sc.

(Plates XVIII–XXII.)

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INTRODUCTION.

The caves of the Oriental Region do not possess the interest of those of some parts of Europe and America. As a rule they are not of vast size or impressive interior; few or none of them contain streams or lakes; their fauna does not appear to be a highly specialized one, and no palaeontological deposits of importance have been discovered in them; they have not, so far as we know, been the home of races whose civilization is extinct. It is, however, no less necessary to study what is ordinary than what is striking; indeed, the former is in many cases the more important from a scientific point of view. Comparatively little attention has yet been directed to the structure and fauna of the limestone caves of Burma and the adjacent countries, and it has seemed worth while, if only in order to stimulate further study, to gather together the scattered and often somewhat inaccessible references in literature, and to add the results, imperfect as they are, of our own several investigations in the Shan States, Tenasserim, the Siamese and the Federated Malay States.

Although the caves are scattered over an area of great extent—it extends from western China in the north to Borneo

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in the south—and are often separated one from another by long distances, they are in many respects remarkably uniform. The formations in which they occur are probably of similar if not identical origin in the different localities, and the manner in which they themselves have been formed is the same: the great sheet of limestone that once covered the country has been partly dissolved and low isolated hills alone remain to represent it. These hills, which often have fantastic forms and rise conspicuous in flat land devoted to or suitable for agriculture, most commonly contain the caves, eaten out of their centres by the action of water. Sometimes the mouths are at the base of the hills, sometimes they open on the face of precipitous cliffs, which may have almost the appearance of white marble, or may be almost black on account of weathering.

A large proportion of the caves are mere recesses which do not penetrate sufficiently far to be at any point beyond the reach of daylight, but some consist of long passages and great chambers within the hill. In many cases there are several series of passages and caverns, the latter of considerable diameter, of great height and usually of circular form with a domed roof. The passages, which are as a rule less lofty than the inner caverns but often of considerable width, wind about from chamber to chamber, often ascending or descending as they do so and in some cases attaining a total length of many hundred yards. It is very common for there to be a small aperture like a skylight in the roof of the larger chambers and sometimes the roof has collapsed more or less completely, leaving the chamber open to the sky and with its floor encumbered with debris. It is apparently owing to this penetration and subsequent destruction of the roofs of caves which occupied the interior of hollow hills that the strange amphitheatres occasionally seen in limestone districts in Burma and Malaya are due.

At a few places the hills in which the caves occur form islands, as in the great lagoon in the north-east of the Malay Peninsula, so like the Chilka Lake of Orissa in many respects, which is marked in some English maps as Senggora Lake, is called by the Siamese simply the "Great Lake" (*Talé Sap*) and is known to the Malays as *Laut Dalam*, the "Inner Sea."

In the islands of this lake and in some of those that lie in the northern part of the Straits of Malacca off the coast of the State of Trang, the caves are a source of revenue to the Siamese Government as nesting-places of one or other of the swifts of the genus *Collocalia* that produce the edible nests of Chinese trade. At nesting-time these caves are zealously protected against poachers, and the right to collect the nests is a strictly preserved state monopoly farmed out at high rent.

A commoner commercial asset of the caves is bat-dung

manure, which, both in Burma and in Siamese territory, is collected annually in many of them. The subject, so far as Burma is concerned, is discussed by Mr. I. H. Burkill in a pamphlet issued as No. 1 in the *Agricultural Ledger* (Calcutta), for 1911.

The earliest description of any of the caves appears to be that given by Capt. W. Foley in his "Notes on the Geology, etc. of the Country in the Neighbourhood of Maulamyeng (vulg. Moulmein)" published in the Journal of this Society for 1836 (Vol. V, pp. 269-281, pl. VII). He mentions as the principal caverns of the district those at Yêtsêy, Tyokhla, Joe-ka-beng, Damatha, Nyown-beng-zeite, Phabia, and describes the Buddha-cave at Dhammathat (or Damatha) and also a small cave a little further to the south near the summit of the hill which had (in 1836) "been but lately selected by the Phúngi, for the better concealment of a quantity of manuscripts written in the *Thalian* or *Burmah* character, and secreted in the upper part of the *Damatha* cavern at a time that the country was invaded by *Tshan* (Siamese)." Some of these manuscripts he procured for presentation to the Asiatic Society.[1] It is evident from his map that the Nyown-beng-zeite[2] caves to which he refers are those now known under the name of Khayon or "Farm Caves."

Another cave near Moulmein which Capt. Foley mentions is situated at *Phabowng Thowng*, a limestone hill on the banks of the Atbaran; this cave has a stream running through it.

The next Burmese cave to be described, was that of Shwe Male (Yule's "*Narrative of the Mission to the Court of Ava in 1855*," London, 1858, pp. 177-83). This cave is in crystalline limestone belonging to the Moyok series.

The caves of the Atbaran River and at Thonzoo (the Three Pagodas) are referred to by Tickell and Parish (*Journ. As. Soc. Benjal*, XXVIII, 1859, pp. 425 and 465-8), the latter author being interested particularly in the vegetation of the hills containing them. The limestone hills near Moulmein were described in 1871 by Stolicza (also in the Journal of this Society) with special reference to their molluscan fauna; he pointed out how the isolation of these rocks admitted of the development of certain persistent peculiarities of the animals of different localities; but he did not describe the caves. Theobald, another member of the Geological Survey of India, mentions them in his "Geology of Pegu" (*Mems. Geo. Surv. Ind.*, X [2], p 139) but does not add greatly to our knowledge

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[1] It is probable that these are still in the Society's possession, but our Burmese MSS. have not yet been adequately catalogued.

[2] Nyaungbinzeik (or Nyown-beng zeite) is a village on the banks of the Ataran River. There is a ferry there on the road from Moulmein to the caves, and it is the only village on the journey.

of the caverns themselves, although he makes an important contribution to the geology of the rocks containing them.

Fea appears to have been the first zoologist to describe the interior of any of the caves. He visited those near Moulmein and, in an interesting letter[1] published by the Geological Society of Italy (*Bull. Soc. Geogr. Ital.*, 1888) dealt with their peculiarities and his collecting in them. The zoological results of his journey are published in the *Ann. Civ. Mus. Stor. Nat.*, 1869–1897; many cave-haunting species are described by specialists in this important series of papers.

The Batu caves near Kuala Lumpur in the Malay State of Selangor were investigated by Ridley at the request of the British Association, in whose Report for 1898 (pp. 572-582) he published the results of his researches. Four caves are carefully described and diagrams of two of them are given; the animals inhabiting their darker parts are recorded with notes on their habits.

In 1899 the members of the Skeat Expedition to the Malay Peninsula visited the caves near Biserat in the Siamese State of Jalor, which had not previously been investigated. In these they discovered several new cavern-haunting species (described in Reports on the Expedition, mostly in the *Proceedings of the Zoological Society of London*, 1900-1903), closely allied to those found by Fea in the Farm Caves. In June, July, October and November, 1902, the Jalor caves were visited again by Robinson and Annandale; their collections have been described in *Fasciculi Malayenses* (Liverpool, 1903-1905), in the supplement ("Itinerary") to which notes on the caves themselves will be found (pp. vi and xxv-xxviii).

The caves of the islands in the Talé Sap are described by Skeat in his report to the British Association (1900); also by Warrington Smythe in his *Five Years in Siam*. Annandale has given certain particulars about those on the coast of Trang in the Supplement to *Fasciculi Malayenses* (p. xv) and in the anthropological part of that work (vol. I, p. 63).

Ancient clay tablets found in caves in Trang and Kedah are described in the following papers: – "Short Notes on a Buddhist Votive Tablet" by C O. Blagden (*Journ. Straits Branch Roy. As. Soc*, 1903, p. 205); "Clay Tablets from Caves in Siamese Malaya" by A. Steffen with notes by Nelson Annandale (*Man*, vol. II, No. 125, pl. M, 1902); "Notes on Clay Tablets from the Malay Peninsula" by Rakhaldas Banerji, with an Introductory Note by N. Annandale (*Journ. As. Soc. Bengal*, [n. s.] vol. III, p. 459, 1907).

The date of the tablets from Trang appears to be about the 8th to the 11th century A.D. Professor Kern of Leyden

[1] Fea's more detailed account of his wanderings ("*Quatro Anni i Birmaine et le Tribu Limitri*") is unfortunately not available in Calcutta.

(who had, however, seen only a photograph) attributed one from Kedah to the 10th century; but Babu Binod Bihari Bidyabinod of the Indian Museum, who has examined this and other specimens from Kedah which Dr. R. Hanitsch, Director of the Raffles Museum, Singapore, has been kind enough to lend us, informs us that they must be considerably older. He is of the opinion, on palaeographic grounds, that they belong to the 7th century; his note is printed in the appendix to this paper (p. 423). In any case their script (pl. XVIII) is North Indian, as is also that of the Trang tablets.

Other clay tablets, apparently of much more recent date, are commonly found in caves in Jalor and Pahang. These tablets probably date from the 18th century A.D. Many of them bear the image of a Buddha seated beneath a seven-headed cobra with expanded hood (pl. XIX). According to Rakhaldas Banerji (*op. cit.*, p. 469) this is the divine Buddha Amoghasiddhi; but Temple (*The Indian Antiquary*, vol. xxii, p. 339), referring to similar images from Burma, regards them as representing Buddha Gotama and suggests their Siamese origin. In one of the caves near Biserat there is a gigantic recumbent figure with a many-headed cobra shielding the head with its hood. This statue, which is said to have been erected by a Siamese nobleman in the eighteenth century, certainly represents the last earthly Buddha, and there can be no doubt that modern Siamese iconography differs from that of ancient India in the use of the protecting many-headed cobra as an emblem.

Archæological descriptions of limestone caves in the Amherst district of Tenasserim are given by Taw Sein Ko in *The Indian Antiquary*, vol. XXI, p. 377 (1892), and by Temple in vol. XXII, p. 327 (1893), of the same publication. Photographs and plans of the Farm Caves and others in the same district, and figures of comparatively recent clay tablets from them are reproduced by the latter author. None of the remains appear to be ancient.

In Tenasserim and Jalor many limestone caves are still used as Buddhist temples, while in Trang and other Siamese States, and also in Yünnan (pl. XXI), they serve the same purpose for Chinese worship.

In parts of both the British and the Siamese Malay States small caves are occupied temporarily as habitations by jungle-tribes (see Skeat and Blagden, *Pagan Races of the Malay Peninsula*, pp. 168, 173), while on the coast of Trang a single large cavern was, until it was desecrated by Chinese pepper planters in search of bat-guano, the tribal burial-place of the *Orang Laut Kappir* or Pagan Sea-Gypsies (Annandale, *Fascic. Malay., Anthrop*, vol. I, p. 63).

The folklore of the caves in Burma and Malaya is probably very extensive, as they are universally regarded with

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age of the whole given as Palaeozoic, the Moulmein beds being provisionally placed in the "lower carboniferous group of European geologists."

In 1863 W. Theobald from the evidence of a few fossils procured from Zwah-ga-byn, a limestone hill which forms a prominent landmark above Moulmein, and is popularly known as the "Duke of York's nose," pronounced the age of the limestone as equivalent to the carboniferous limestone of Europe. He also regarded it as probable that the limestone met with in the Mergui Archipelago belonged to the same formation.[1]

To quote from Theobald's Memoir:—

> "The most marked feature of this limestone is its mode of occurrence in steeply scarped hills, the sides of which overhang, as may be seen in the case of the hills near Moulmein, which rise abruptly from the low inundated plains between the Gaine and the Attaran rivers, and exhibit the precise appearance of what they undoubtedly were at no remote geological period—sea-girt rocks, such as still stud the Mergui Archipelago, and which from their position in low-lying alluvial plains even now, during the rains, are approachable only by boats, through a mimic freshwater sea."

Theobald also speaks of the existence of other extensive caves to the north-east beyond Toungoo.

It is not known what became of the fossils mentioned both by Oldham and Theobald. They are not in the collection of the Geological Survey of India and were never described in detail. Fortunately, some years later, a further small series of foraminifera, corals, brachiopoda and gastropoda was obtained by P. N. Bose from the limestone hills near Therabwin in Tenasserim.

The following species were determined by F. Noetling[2] who pronounced them to be of carboniferous (probably upper carboniferous) age.

Schwagerina oldhami, Noetl.
Lonsdaleia salinaria, Waag. and Wentz.
Lithostrotion, spec. nov.
Araepora cf *ramosa*, Waag and Wentz.
Polypora cf. *biarmica*, Keyserl.
Productus cf. *sumatrensis*, F. Roemer.
Athyris, sp.
Spirifer, sp.
Bellerophon, sp.

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[1] W. Theobald, On the Geology of Pegu. *Mem. Geol. Surv. India*, Vol. X, p. 138.

[2] F. Noetling, Carboniferous Fossils from Tenasserim. *Rec. Geol. Surv. India*, Vol. XXVI, Pt. 3, pp. 96—100.

Pleurotomaria aff. *durga*, Waag.
Murchisonia, sp.

This fauna is one in which Indian and Sumatran types are mixed and it is probably of the same age as that from Zwah-ga-byn hill.

It is in every degree probable that similar limestones of anthracolithic age extend to the far south through the Malay Peninsula, and that the caves of that area are in identical formations.[1]

In the state of Pahang (F. M. S.), an extensive calcareous series consisting chiefly of limestones exists. It has been termed the Raub Series by J. B. Scrivenor who writes[2]:—

> "The big limestone hills form a picturesque feature in the landscape wherever they occur, similar to those on the west of the Main Range. Gunong Sinyum, with its huge caves, is perhaps the most striking of them, although not the largest. In Sarawak and Kinta there is clear evidence that the steep cliffs of the limestone hills coincide with fault planes, and it might be expected that the same explanation of the formation of these precipices would be found in Pahang. It has not been possible, however, to prove this, and in the absence of clear evidence we must regard the Pahang limestone hills as having been formed by the processes of denudation acting unequally on masses of strongly jointed and tilted beds of limestones. The caves found in the hills are as beautiful as caves elsewhere in limestone country, but present no special feature."

Fossils have been found in a few localities. From the Mill Gully and Gua Sah exposures, obscure coral, crinoidal, and other structures have been reported, as well as some fairly good remains of Cephalopoda which C. C. Crick believes belong to the genera *Orthoceras*

Cyrtoceras

Gyroceras

and *Solenocheilus*,

pointing to a carboniferous age for the rocks.

From Lubok Sukum imperfect casts and impressions have been obtained which Messrs. Newton and Crick think may be of permian age. They consist of circular or elliptical forms resembling Waagen's *Xenodiscus*, straight tube-like bodies which appear to be closely allied to *Dentalium herculeu* of De Koninck and a number of other organisms, too obscure for

[1] Caves in the Malay Peninsula. *Brit. Assoc. Repts.*, 1898, p. 571.
[2] J. B. Scrivenor, The Geology and Mining Industries of Ulu Pahang, 1911, p 33.

determination, among them being an Aviculopectinoid impression and some possible Brachiopod remains.[1]

J. M. Maclaren is of the opinion that the Raub Series will prove to resemble the limestones and shales of the Southern Shan States described by C. S. Middlemiss.[2]

W. W. Skeat, observing the occurrence of fossils on some of the images of Buddha in the north-eastern part of the Malay Peninsula, was led to search for the quarry from which the rock was obtained out of which the images were carved, and it was at length found on the western flank of the great central axis of the Peninsula.[3]

From the fossiliferous limestone so obtained Prof. T. Mckenny Hughes determined a trilobite (*Proetus*), encrinite stems and arms, and several species of lamellibranchs and brachiopods, including at least one *Chonetes*. "There is a well-preserved and highly ornamented *Pleurotomaria* and a Cephalopod, which by its horse-shoe lobes confirms what is suggested by the general facies, namely, that the deposit belongs to the highest beds of the Carboniferous, or rather, perhaps, to beds intermediate between the Carboniferous and the overlying system to which the compromise name of Permo-Carboniferous has been applied."

It is interesting to note that Messrs. Newton and Crick consider their fossils younger than the ones referred to above; but according to Dr. Annandale the limestone from which Skeat's fossils were obtained was very different in structure

[1] *Loc. cit.*, p. 34.

Since the above account was written, J. B. Scrivenor has published a summary of his ten years' work in an illuminating report entitled, The Geological History of the Malay Peninsula. (*Quart. Journ. Geol. Soc.*, Vol. 69, 1913, pp. 343 371). In this it is stated that he is not prepared to accept the scanty palaeontological evidence regarding the age of the Raub Series without qualification. To quote,—"The fossils found so far, in fact, have done no more than give a hint as to the age of the rocks; they may be carboniferous or permo-carboniferous. Other evidence, unknown at the time when the fossils were described, makes it improbable that they are permian" (p. 353)

This evidence depends upon the discovery in Perak, immediately above the Raub Series, of glacial clays, which Scrivenor correlates with the Talchirs of the Indian Peninsula. It would be too far from the purpose of the present paper to enter into the question of the exact age of the Gondwana boulder beds here, but it may be mentioned that in the course of the discussion on Scrivenor's paper, La Touche argued that the Malayan Glacial Beds belong to a later period of glaciation than that represented by the Talchirs. He expressed the opinion, however, that the Raub Series was apparently a southward extension of a portion of the dolomitic limestones of the Burmese Shan States, probably representing their upper parts and pointing to the transgression of the carboniferous sea southwards, followed by an eastward retreat of the coast of Gondwanaland.

[2] Gold; its Geological Occurrence and Geographical Distribution, 1908, p. 287

[3] Natural History and Ethnography of the Malay Peninsula. *Brit. Assoc. Repts.*, 1901, p. 414.

and appearance from that which formed the walls of caves in the neighbourhood.

In Siam, the whole of the great range on the west which extends almost unbroken from the extreme south of the kingdom to the most northerly point above Chieng Sen on the Mekong, and thence northwards through the British trans-Salween Shan States into China, appears to consist largely of enormously thick limestone beds, probably of carboniferous age in part, lying upon metamorphic and schistose formations. These limestone beds are found throughout the Malayan Provinces and in the Ratburi district. The Chieng Mai district and the series of hill ranges across northern Siam from Chieng Sen down to Pitsanulock are said to present much the same geological features. In Eastern Siam, limestone hills are found towards the north and west, and where the Mekong turns from east to south they again appear as a barrier of ever-decreasing height between the river and the basin of Eastern Siam. At the junction of the Nam Mun and the main river the great masses of limestone which form the southern boundary of the eastern part of the country come in, and running westwards as far as the Dong Phaya Yen mountains, overlook the plains of Central Siam. Limestone pinnacles are found piercing the alluvium of Central Siam, as at Chainat, Prabat, and Kabin [1]

Permo-Carboniferous limestones are known to occur in Sumatra, Toba-landan, Timor and Rotti.[2] In Western Borneo they contain caves which are very similar to the Burmese and Malayan ones.[3]

Further to the east in Tongking and the Laos, limestones of the same age have been identified.

To the north of the Moulmein, Amherst and Thaton districts the limestones stretch through Karenni into the Shan States. Caves are found in them along the edge of the hills bordering on the Shan States and dividing them from the broad plains of the Irrawaddy valley. These caves are well known as they yield large quantities of bat guano.[4] In the Southern Shan States the limestones which often contain caves, as for example in the neighbourhood of Kalaw, have been well described by C. S. Middlemiss who writes as follows:—

> "The dark-grey limestone frequently weathers almost black into sharp-edged honeycombed masses, into pinnacled crags, weather-beaten towers and walls: into deep basins and swallow holes (often as regular and circular as

1 W. A. Graham, Siam, London, 1912, pp. 86-96.
2 See literature quoted by J. B. Scrivenor *loc. cit.*, p. 48.
3 *Brit. Assoc. Repts.*, 1898, p. 581.
4 I H Burkhill, Guano in India, *The Agricultural Ledger*, 1911, No. 1, p. 7.

a gigantic amphitheatre, but sometimes funnel-shaped): into strange valley systems, without connection one with the other, and that often end mysteriously either as underground passages down which streams precipitate themselves and become lost, or as marshes and lakes where evaporation helped out no doubt by subterranean percolation causes a disappearance of the waters: into innumerable caves and passages beneath the ground, some now high and dry from the waters that caused them and which are locally mined for the nitrates that have accumulated upon the floors from the decomposition of cave animal deposits, others used as show places and temples; others again unknown to fame and rich in their virgin beauty of stalactitic growths."[1]

In the Northern Shan States these limestones are well known, and have been described in various papers appearing in the publications of the Geological Survey of India by T. D. La Touche.[2] Wherever they have been examined in this area by myself, depressions appearing on the surface of the ground which they underlay have always been a striking feature, as has also been the fact that their drainage very often disappears underground. La Touche has noted how these depressions vary in size from "pipes" a few feet in diameter to "swallow-holes" and funnel-shaped "punch-bowls," of which the latter are by far the most common, and from these to enclosed valleys several miles in length and breadth, traversed by running streams. These phenomena are due to underground dissolution of the rock and the consequent settling down of the roof of a cavity or cavern, too weak to support its own weight. Owing to the crushed condition of the limestones in the Northern Shan States, as a result of the tectonic stresses induced by the great earth movements which took place after their formation, large open caverns such as occur near Moulmein and further south are of rare occurrence. In the Southern Shan States caverns are known to exist and it is believed that systematic searching would reveal the presence of many others.

C. Deiner has described rich collections of anthracolithic fossils collected by La Touche and Middlemiss in the Northern and Southern Shan States. His opinion regarding their ages is quoted below:—

"In brief the anthracolithic faunas of Burma and of the Indian region (Salt Range-Himalayas), so closely situated

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[1] C. S. Middlemiss, Report on a Geological Reconnaissance in parts of the Southern Shan States and Karenni. *General Rept., Geol. Surv. India*, 1899-1900, pp. 130-131.

[2] See especially T. H. D. La Touche, Geology of the Northern Shan States. *Mem. Geol. Surv. India*, Vol. XXIX, Pt. II.

geographically, must be considered as belonging to the same zoogeographical province. Their similarity may be interpreted as due both to their proximity in geographical position, and to their stratigraphical homotaxis. This correlation places the anthracolithic faunas of the Shan States on the same level as the middle and upper Productus limestone of the Salt Range or of exotic block of Chitichun No. 1.''[1]

Although somewhat beyond the region treated of in this paper mention may be made of the fact that both devonian and anthracolithic limestones attain a considerable development in the Chinese province of Yünnan, and that in the western parts of the province small caverns are sometimes found in the rocks of the latter group. As an example of these a photograph of the Ta-shih-wo cave near the edge of the Yung-ch'ang fu plain is appended. (Pl. XXI).

It is probable that in many of the caves of Burma and the Malay Peninsula, deposits of recent or approximately recent fossil or sub-fossil remains will be found: but no such deposits have as yet been investigated. The teeth of a large tiger and a skull of the Bamboo-Rat (*Rhizomys sumatrensis*) have, however, been forwarded to Calcutta for examination, with the information that they were found in a small cave near Mogok, Ruby Mines District, and in some of the Jalor caves there are large beds of freshwater shells and mammalian bones.

PART II.—THE FAUNA OF THE CAVES.

The following list of the animals that have been recorded from the limestone caves of Burma and Malaya, or are represented therefrom by authentically named specimens in the Indian Museum, is compiled for the most part from Ridley's ''Account of caves in the Malay Peninsula'' in the *Rep. Brit. As.* for 1898; from the papers on the zoological results of the Skeat Expedition to the Malay Peninsula, published mostly in the *Proc. Zool Soc. London* between 1900-1903; from the zoological parts of Annandale and Robinson's *Fasciculi Malayenses*, and from papers on the late Signor Fea's Burmese collection in the *Ann. Civ. Mus. Genova* (1889-1897).

We have added obeservations of our own, more particularly on the Orthoptera and Pedipalpi.

[1] C. Diener, Anthracolithic Fossils of the Shan States. *Pal. Ind.*, New Series, Vol. III, Mem. No. 4.

Name.	Cave Locality.	Remarks.
Mammalia.		
Carnivora.		
Felis tigris, L.	Batu Caves ..	Commonly rests in caves near Kuala Lumpur.
Insectivora.		
Soriculus nigrescens (Gray)	Near Biserat ..	A specimen was trapped by the Skeat Expedition in the entrance to one of the larger caves.
Chiroptera.		
Cynopterus, sp.	Batu Caves	Found by Ridley in large numbers in one cave.
Xantharpyia amplexicaudata (Geoff.) ..		
Eonycteris spelaea (Dobson)	Farm Caves ..	Only known from the Farm Caves.
Rhinolophus affinis, Horsf.		
,, *minor*, Horsf.		
Hipposiderus armiger (Hodgs.)		
,, *diadema* (Geoff.)		Common cave-haunting species of wide distribution. Several of the species have been or will doubtless be divided at least into local races.
,, *larvatus* (Horsf.) ..		
,, *bicolor* (Temm.)		
Taphozous longimanus, Hardw.		
,, *saccolaemus*, Temm.		
Rhinopoma microphyllum, Geoff. ..	Dhammathat ..	Found in large numbers, to apparently[1] the exclusion of other species, in the long, dark, tunnel-like cave.
Nyctinomus plicatus (Buchn.) ..		A common cave-haunting species.

[1] Anderson, in the Administration Report of the Marine Survey of India for the official year 1897-8, describes the emergence of *Nyctinomus plicatus* in a dense stream from a cave at Hpagat on the Salween, 25 miles above Moulmein. These bats were followed by small numbers of a much larger species, and it is possible that the *Rhinopoma* at Dhammathat may also have been associated with some scarcer species taking flight at a different hour.

Name.	Cave Locality.	Remarks.
Rodentia.		
Sciurus atridorsalis, (Gray.)	Farm Caves ..	A specimen was taken by Fea in one of these caves.
Mus surifer, Miller.	Jalor ..	Common in these caves but not peculiar to them.
Rhizomys sumatrensis (Raff.) ..	Mogok ..	A subfossil skull has been examined by Mr. E. Vredenburg.
Hystrix grotei, Gray.	Jalor ..	Apparently rests in large numbers in caves during the day.
Ruminantia.		
Nemorhaedus swettenhami, Butler ..	Jalor ..	See subsequent notes. The species (or race) is called *Capricornis sumatrensis swettenhami* by Lydekker,[1] in *Cat. Rum. Brit. Mus.*, p. 188 (1913).
Aves.		
Macrochires.		
Collocalia innominata, Hume ..	Talé Sap ..	Breeds in caves.
Reptilia.		
Lacertilia.		
Gymmodactylus pulchellus (Gray.) ..		Common in caves in different parts of the Malay Peninsula ; also found in the jungle.
Lygosoma scotophilum, Boulenger ..	Batu Caves ..	Originally described from a cave but also found in the jungle,
Reptilia.		
Ophidia.		
Coluber taeniurus (Cope).	Batu Caves ; Jalor	pale phase (see below) is found in caves.
Batrachia.		
Ecaudata.		
Rana glandulosa, Boulenger	Batu Caves	By no means confined to caves.
,, *jerboa* (Gunther)	,,	
Bufo asper, Gravh.	,,	

MOLLUSCA.		
Gastropoda.		
Streptaxis sankeyi, Benson	Farm Caves ..	Recorded from several localities outside the caves.
Hypselostoma laidlawi, Collinge ..	Jalor	Only known from a cave.
Prosopeas tchehelense, de Morg. ..	,, ...	See below. A common species under cliffs as well as in caves.
Opeas innocens, Preston	Farm Caves ..	Only known from dead shells from a cave.
Ophisthostoma annandaleii, Sykes ..	Jalor ..	Only known from a cave.
Ditropsis cavernae, Sykes	,, ..	Only known from a cave.
INSECTA.		
Thysanura.		
Japyx indicus, Oud	Farm Caves ..	Not uncommon also under logs of wood in the open.
Collembola.		
Neanura pudibunda, Imms	,, ..	Only known from caves; brilliantly coloured and with eyes.
Cyphoderus simulans, Imms	,, ..	Found with preceding species; blind and colourless.
Orthoptera.		
Chelisoches morio, Fabr.	Jalor	A common species outside caves in Malaya.
Periplaneta sp. (? *americana*, Linn.) ..	,,	
Spelaeoblatta gestroi, Bolivar ..	Karen country ..	Only found in a cave.
Rhaphiodophora, (? *brunneri*, Kirby) ..	Farm Caves ..	Identical with a species found in the jungle.
Diestrammena unicolor, Brunner ..	,, ..	Also recorded from northern China.
,, *annandalei*, Kirby ..	Jalor	Only known from the Jalor Caves.
,, sp.	Batu Caves ..	Not identified specifically.
Neuroptera.		
Myrmecaelurus, sp.	,, .	Recorded by Ridley.

[1] Two errors may be noticed in this author's statement as to the skin of the Malay Serow presented to the British Museum by Messrs. H. C. Robinson and N. Annandale. It is not the type, which was from the Larut Hills; and it came from the neighbourhood of Biserat in Jalor. So far as we are aware, there is no place in the Malay Peninsula called Bigerat, and Biserat is nowhere near the Larut Hills.

Name.	Cave Locality.	Remarks.
Hymenoptera.		
Ponera confinis, Roger var.	Farm Caves ..	Abundant in caves near Moulmein.
Lepidoptera.		
Pyralis fumipennis, Butler	Jalor	By no means confined to caves, in which, however, it apparently breeds.
Pyralis pictalis, Curt.	Farm Caves ..	Apparently breeds in the largest of these caves, to which it is not confined.
Crypsithyris spelaea, Meyrick ..	,, ..	Probably a true cavernicolous species.
Diptera.		
Sciara pallescens, Brunetti	,, ..	Perhaps a pale form of a species found in the open in Bengal (see below).
Nycteribosca amboinensis, Rondani / *Raymondia pagodarum*, Speiser ..	Jalor	Bat-parasites.
Ascodipteron siamense, Speiser \		
Myriapoda.		
Chilognatha.		
Platyrhachis malaccanus (Peters) ..	Jalor	Not a true cavernicolous species.
Doratonotus cavernicola, Sinclair ..	,, ..	Only known from a cave.
Cambaropsis calva (Pocock), var. ..	Farm Caves ..	The typical form of this species was not found in a cave.
Cambalamorpha feae (Pocock) ..	.. ..	Perhaps a true cavernicolous species.
Schizotarsia.		
Scutigera longicornis (Fabr.)... ..	.. ..	See notes; probably not confined to caves.
,, *maculata*	.. ,,	
,, *decipiens* (Verh.)	,,	Probably not confined to caves.
,, sp.	Batu Caves	
Arachnida.		
Scorpiones.		
Chaerilus, sp. nov.	Dark Cave	

Pedipalpi.			
Hypoctonus wood-masoni (Oates) ..	Farm Cavës	}	Not confined to caves.
,, ? *formosus*, Oates ..	,,		
Schizomus (*s. str.*) *cavernicola*, Gravely .	,,	..	Only known from these caves.
Stygophyrynus cavernicola (Thor.) ..	Tenasserim	..	Probably confined to the caves near Moulmein (see notes).
Stygophyrynus cerberus, Simon.	Jalor	..	Probably confined to the Jalor caves; closely related to last species.
Catagius pusillus, Thor.	Tenasserim	..	Only known from caves in the neighbourhood of Moulmein.
Araneae.			
Talanistes cavernicola, Thor.	Farm Caves		
Althepus pictus, Thor.	,,	}	Probably not true cavernicolous species.
Pholcus diopsis, Simon	Jalor		
Acari.			
Uropoda, sp.	Farm Caves		
CRUSTACEA.			
Isopoda.			
Armadillo infuscatus, Budde-Lund. ..	Jalor	..	Only known from a cave.
,, *intermixtus*	Batu Caves	..	Recorded by Ridley. We have not been able to discover the author of the species.[1]

[1] Mr. Collinge informs us that that no description of this species appears to have been published. He also tells us that an Isopod collected by Gravely from among pieces of decaying wood in the depths of the large Farm Cave is blind.

MAMMALIA.

Literature.

1876. Dobson, *Catalogue of the Chiroptera in the British Museum.*
1889 Thomas and Doria, *Ann. Mus. Civ. Genova* (2) VII, p. 92.
1888-1891. Blanford, *Fauna of British India, Mammalia.*
1900. Bonhote, *Proc. Zool. Soc. London*, 1400, p. 869.
1903. Bonhote, Report on the Mammals, *Fasciculi Malayenses* (Zool.) 1, p. 1.

The species recorded in our list are named for the most part on the authority of Dobson, who described one of the bats; of Oldfield Thomas and Doria, who worked out the collection of mammals made by Fea in Burma, or of Bonhote, who reported on those obtained by the Skeat Expedition and by Annandale and Robinson in the Malay Peninsula. *Rhizomys sumatrensis* is included on the evidence of a sub-fossil skull recently sent for identification, with the teeth of a large tiger, to the Geological Survey of India.

None of the mammals are cavernicolous in the sense of living in caves without ever abandoning them. The bats, of which only a small proportion of the cave-haunting species of Burma and Malaya have probably been recorded as yet from caves, merely use them as places of diurnal retreat, as is probably also the case with the porcupine; and although some species probably use caves for this purpose always, others are equally content with an overhanging rock or a hollow tree. Sometimes one species of bat appears to haunt a cave to the exclusion of all others; sometimes several or many species occur together.

The tiger and the Malayan Serow belong to a different category in that they only visit the caves occasionally, using them as places of shelter but probably never as permanent abodes. *Nemorhaedus swettenhami* also makes another use, in the neighbourhood of Jalor, of certain caves of which the roof has collapsed, frequenting them habitually for the purpose of dropping its dung. Apparently one such cavern or amphitheatre is set aside for the purpose in each of the little limestone hills of the district. A similar habit has been observed in other antelopes.

Animals such as *Mus surifer* belong to a third category, for it is probable that certain individuals of the species take up a permanent abode in caves, in which they find the greater part or the whole of their food. Most individuals of the species are, however, not cavernicolous.

None of the cave-haunting mammals of Burma or Malaya, to what ver category they belong, appear to be modified structurally in accordance with this habit. Most of the species

have a fairly wide distribution outside caves, but *Eonycteris spelaea* has only been taken in the Farm Caves, and in any case it is impossible at present to be sure of the range of any of the smaller Burmo-Malayan mammals, owing to the intensive study of the Oriental species now in progress in European and American museums.

BIRDS.

Literature.

1895. Blanford, *Fauna of British India, Birds* III.
1901. Bonhote, *Proc. Zool. Soc. London*, p. 68.

It is probable that many species of birds occasionally nest in the mouths of caves, but only one species can be asserted definitely to breed in the interior of the limestone caves of Malaya or Burma, namely *Collocalia innominata*, Hume, specimens of which were taken by members of the Skeat Expedition off the islands of the Talé Sap from which edible nests are collected for commercial purposes. Possibly it is the nests of this species also that are collected in the caves of limestone islands off the northern part of the west coast of the Malay Peninsula, but Blanford stated in 1895 (*op. cit.*, p. 178) that the edible birds' nests of commerce were obtained only, so far as was then known, from *C. francica* (Gmel.), which is found in Tenasserim, the Andaman and the Nicobar Is., as well as in the Malay Archipelago on the one hand and Arrakan on the other. *C. innominata* is known from the Andamans and from Tenasserim as well as the Malay Peninsula.

REPTILES and BATRACHIA.

Literature.

1898. Ridley, *Rep. Brit. Ass.*, p. 572.
1903. Boulenger, "Report on the Reptiles." *Fasciculi Malayenses* (Zool.) I, p. 133.
1903, 1904. Butler, *Jour. Bombay Nat. Hist. Soc.* XV, pp. 193 387.
1912. Boulenger, *Fauna of the Malay Peninsula, Reptiles and Batrachia.*

No blind or colourless reptile or batrachian is known from the caves of Burma and Malaya, and no species of either group appears to be confined to them. The snake *Coluber taeniurus* (plate XXII), however, provides interesting evidence as to the effects of the cave-dwelling habit on the colouration of the individual.

Pale individuals (fig. B) were first discovered in the Batu Caves and were accepted as the types of a new variety (*ridleyi*, Boulenger), no normally coloured examples of the species then being known from the Malay Peninsula. The same phase was found later in the Jalor Caves, and dark individuals of the

typical form have been discovered sparingly in different parts of the Malay Peninsula, in which the species (except in caves) is apparently much scarcer than it is in other parts of its range. This is wide, extending from Malaya into Burma and the neighbouring countries, the Eastern Himalayas and Northern China. No very young individual has yet been found in caves, but the smallest yet obtained in them—it was captured by Annandale in 1899 near Kuala Lumpur—approached the typical form in colouration much more closely than did larger examples from the same cave. The snake is naturally retiring in habits; several specimens were dug up in the course of road-making in the Abor country during the recent expedition. The cave-phase, owing chiefly to the loss of brown and reddish pigment, has the anterior part of the body (except for a black line through the eye) nearly white, while the posterior part bears conspicuous black longitudinal stripes on an almost white ground. Ridley has pointed out that, lying as the snake commonly does on narrow ledges in the white walls of caves, this type of colouration aids in concealing it by torchlight; but torchlight is not a natural feature of the caves.

It may be stated with some confidence that *Coluber taeniurus* is not, as a species, cavernicolous, but usually leads a more or less nocturnal life in the open, hiding by day in holes, under logs and in other such positions. Certain individuals, however, enter the caves; these find a plentiful food-supply in the bats and so grow to their full size without emerging. This mode of life has a peculiar effect on their pigmentation, apparently destroying brown and reddish pigments without affecting black to the same extent; some black markings, however, disappear, as is clearly shown in the figures of the two phases (pl. XXII).

The lizard *Gymnodactylus pulchellus* is a species occasionally found on tree-trunks in the jungle far from caves. It also is nocturnal in habits and, curiously enough, is also striped with black and white, but transversely instead of longitudinally. No difference exists in this (or in any other) respect between cavernicolous and arboreal individuals. Many individuals have adopted a cavernicolous life and the species has been found in caves in widely separated parts of the Malay Peninsula. Although the species is reported to occur in Tenasserim, it has not yet been found in any Burmese cave.

The other lizard on our list (*Lygosoma scotophilum*), although it was originally captured in the inner parts of one of the Batu Caves, has no striking peculiarity of colouration and has since been taken in the jungle

A third species of this suborder might perhaps be added to the list, namely *Gonotodes affinis* (Stoliczka), specimens of which have recently been collected in the Batu Caves. As a rule it haunts either rocks at the edge of streams or else tree-

trunks in which, owing to the coalesence of the buttresses characteristic of some jungle trees, pools of water accumulate. It is sometimes almost amphibious in habits.

The Batrachia recorded from the Batu Caves are nocturnal species that also occur in the jungle and have no particular spelaeological interest.

MOLLUSCA.

Literature.

1871. Stoliczka, *Journ. As. Soc. Bengal*, XL (2), pp. 145, 217.
1902. Collinge, *Journ. Malac.* IX, p. 71.
1903. Sykes, *Proc. Zool. Soc. London*, vol. I, p. 194.
1908. Blanford and Godwin-Austen, *Faun. Brit. Ind.*, *Mollusca*, I.
1910. Preston, *Rec. Ind. Mus.*, V, p. 33.

In addition to the species of Mollusca included in our list there are others that have been found occasionally in caves; for some land-snails occurring only on the limestone cliffs of the Siamese Malay States and Tenasserim, and also others of less restricted range (*e.g.* several species of *Rhiostoma* and *Cyclophorus*), occasionally make their way into caverns, while floods not infrequently wash in the shells of water-snails such as *Ampullaria* and *Vivipara*. Some of the terrestrial species described by Stoliczka from the cliffs at the Farm Caves and at Dhammathat might possibly find a place among cavernicolous forms with equal justice to *Streptaxis sankeyi*, Bsn., and *Prosopeas tchehelense*, de Morg., both of which have been found in the open. We have, however, attempted to restrict the list so far as possible to species which, to our knowledge, are either strictly cavernicolous or else habitually enter caves for purposes of protection or to seek food. The *Streptaxis* is so common in the Farm Caves that we see no reason to think that it does not do so, while the *Prosopeas* occurs not infrequently in enormous numbers in the darkest part of the Jalor and Selangor Caves, apparently feeding on bats' dung. *Opeas innocens*, Preston, is only known from the Farm Caves, in which, however, only dead shells were found.

The case of *P. tchehelense* is interesting, for the shell would appear at first sight to be specially modified for a cavernicolous life. It was originally described as being "*fusca*", but in specimens from at any rate one of the Jalor caves both the shell and the body of the animal are as a rule totally devoid of pigment. The eye, however, is not only pigmented but, as is shown by sections, perfectly normal in structure. The species has a wide range in the Malay Peninsula. Large swarms are often found under overhanging cliffs as well as in caves.

The other molluscs, the names of which are given in the

list, are minute colourless species found as yet only on the floor of caves. They are probably cavernicolous in a strict sense. but nothing is known of their habits or anatomy.

INSECTS.

Literature.

Collembola.

1912. Imms, *Proc. Zool. Soc. London*, p. 80.

Orthoptera.

1888. Brunner von Wattenwyl, *Verh. K. K. Zool. Bot. Gesells. Wien.* XXXVIII, p. 229.
1893. Brunner von Wattenwyl, *Ann Civ. Mus. Genova* (2) XIII (XXXIII), p. 193.
1897. Bolivar, *Ann. Civ. Mus. Genova* (2) XVIII (XXXVIII), p. 32.
1900. Annandale, *Ent. Record*, XII, p. 75.
1908. Kirby, *Rec. Ind. Mus.*, II, p. 43.

Hymenoptera.

1913. Wheeler, *Rec. Ind. Mus.* VIII, p. 233.

Lepidoptera.

1903. Swinhoe, "Report on the Moths", *Fascic. Malay. Zool.*, I, p. 99.
1909. Meyrick, *Rec. Ind. Mus.*, II, p. 399.

Diptera.

1903. Speiser, "Report on the Diptera Pupipara". *Fascic. Malay.* (Zool.) sp.
1912. Brunnetti, *Faun. Brit. Ind., Dipt. Nemocera.*

A noteworthy feature of our list of the insects of the Burmese and Malayan caves is the total absence of the names of beetles. Many species of the order must actually occur, but although both Ridley in Selangor and Gravely in Tenasserim obtained specimens that can be assigned to well-known families. it has not been possible to arrange for their precise identification. This is also the case with the few Rhynchota that have been collected.

Of the two Collembola (*Neanura pudibunda* and *Cyphoderus simulans*) described by Imms from the Farm Caves, one (the *Cyphoderus*) is regarded by him as strictly cavernicolous, apparently because it is colourless and blind; but other species of the genus precisely similar in these respects are found in

ants' or termites' nests and even under stones at the edge of water (see Carpenter, *Journ. As. Soc. Bengal*, 1913, p. 215). *Neanura pudibunda* is of a bright red colour and possesses eyes. The two species occur together.

Among the Orthoptera of the caves the most interesting are the wingless grasshoppers of the subfamily Stenopelmatinae, of which three species have been recorded from them, one from the Farm Caves (*Diestrammena unicolor*, Brunner), one from those of Jalor (*D. annandalei*, Kirby), and one from the Batu Caves (*Diestrammena*, sp.). A fourth was discovered by Gravely in the Farm Caves. but its specific identification is a little doubtful. It belongs to the genus *Rhaphidophora* and is identical with one (probably *R. brunneri*, Kirby) that occurs in the jungles of the same district. Unlike the species of *Diestrammena*, which live as a rule on the cave-walls and on rocks rising from the ground, it inhabits burrows in the soil of the floor. The species of *Diestrammena* may be considered separately, as although not always cavernicolous they are very characteristic of the fauna of caves.

D. unicolor is reported to occur in northern China (Vladivostok and Pekin) as well in the Farm Caves, but in Tenasserim has only been taken in them and in those at Dhammathat in the same district. In the caves it is extremely abundant. It exhibits considerable individual variation in colour, and the young, instead of being almost unicolourous, are distinctly mottled. When disturbed it is extremely active; it seems to be more sensitive to the smell (? or heat) of a torch than to the light of an acetylene lamp. The antennæ are much longer than those of the *Rhaphidophora* and appear, to judge from the basal part, to be (like those of many other Locustidae) asymmetrical. In none of our specimens are both antennae complete, but in those from the Farm Caves the basal joint of the right antenna is usually larger than that of the left, while the converse is usually the case in those we have examined from Dhammathat.

D. annandalei has only been taken in the Jalor Caves, in all of which it is extremely abundant, both on the walls and on the floor. It apparently feeds on bats' dung and is itself the prey of the large scorpion-spider *Stygophrymus cerberus*. The antennæ appear to have slightly different functions, the longer one being held out straight in front of the body when the animal is at rest, while the shorter one moves round nearly in a circle. Doubtless this enables the insect to appreciate the approach of an enemy, living as it does in the dark.

The species of *Diestrammena* that occurs in the Selangor caves has not been identified, and may be the same as one of the preceding two. Ridley, however, states that it utters at times a feeble chirp, whereas the species from Tenasserim and Jalor have not been observed to do so.

Most of the other Orthoptera in the list (including the

earwig *Chelisoches morio*) are nocturnal species which probably leave the caves at night. The cockroach *Spelæoblatta gestroi* may, however, be strictly cavernicolous. It was found by Fea in a cave in the Karen country; but nothing definite seems to be known about its habits.

Ants are not uncommon in some of the caves, but the only species as yet identified is one from the large Farm Cave, in which it is abundant. Professor Wheeler has been kind enough to examine specimens, which he assigns to an undescribed variety of *Ponera confinis*, Roger. There is nothing to prove that they are modified in correlation with a cavernicolous life; indeed, they are darker than the typical form of the species.

The three species of moths found in the caves belong to two genera both of which are represented by many non-cavernicolous species. Meyrick, who described the Microlepidopteron *Crypsithyris spelæa* from the Farm Caves, believes it to be especially modified in that it is colourless except for its eyes, which are, however, well pigmented. A similar moth occurs in the Jalor caves but has not been identified. The two species of the genus *Pyralis* that have been obtained in the caves are both well pigmented moths of rather conspicuous colouration, and have been taken in districts in which no limestone caves exist; yet it is probable that both breed in such caves when an opportunity occurs. *P. fumipennis* was found in large numbers on the walls of one of the largest of the Jalor caves at some distance from the entrance; on the floor of the same cave, amidst bats' dung, still larger numbers of little caterpillars were observed, each inhabiting and dragging with it a small bean-shaped case made partly of the remains of insects. There can be little doubt that these caterpillars were the larvae of the moth. Of *P. pictalis* a single specimen was taken in one of the Farm Caves. It was resting on the wall in the dark. Larvae similar to those taken in Jalor were also observed on the floor.

Of the four species of Diptera recorded from the caves three (*Victoribosca amboinensis*, *Raymondia pagodarum* and *Ascodipteron siamense*) are bat-parasites and as such of no particular interest from a spelæological point of view. The fourth (*Sciara pallescens*, Brunetti) is a small fungus midge which is at any rate considerably paler than the majority of its congeners. Indeed, Brunetti is of the opinion that it is possibly no more than a pale phase of *S. fulvescens*, a form taken in the open in Bengal. Each nominal species is at present known from a single specimen. The type of *S. pallescens* was taken in the darkest part of the largest of the Farm Caves. Ridley records a small Chironomid midge as being abundant in one of the Batu Caves, but it has not been identified or described.

The insects actually identified and recorded from the caves probably represent only a small proportion of those that occur.

MYRIAPODA.

Literature.

1890, 1891, 1893. Pocock, *Ann. Civ. Mus. Genova* (2) X (XXX), pp. 384. 401, XIII (XXXIII), p. 390.
1898. Ridley, *Rep. Brit. As.*, p. 580.
1901. Sinclair, *Proc. Zool. Soc. London*, p. 517.

Millepedes are often common in the caves, which, in Jalor at any rate, are a favourite resort of large Polydesmidæ (such as *Platyrachis malaccanus*) by no means exclusively cavernicolous. It is probable, however, that some Oriental Myriapoda actually are so. This is possibly the case with *Cambalomorpha feae*,[1] a small whitish Julid very abundant in the Farm Caves, in which it has been obtained by ourselves as well as by others. The Polydesmid *Deratonotus cavernicola*, which is of a pale brown colour, may also be strictly cavernicolous, but this is more doubtful.

A particular interest attaches itself to the *Scutigerae*, which are often found in caves as well as under stones and logs in the open, for very little is yet known of the Oriental representatives of the family. Probably no species of this family on our list is strictly confined to caves, and all are strongly pigmented.

A peculiar habit, possibly correlated with life in the dark, was noted by Gravely in the large Farm Cave in the case of a *Scutigera* which Professor Silvestri has identified as *S. decipiens* (Verh.). Representatives of this species were not very numerous and, being extremely sensitive, were difficult to catch. Several were seen both on the walls of the cave and among the large stones on the floor. An individual seen on an overhanging ridge near the floor was hauled out in a net, on the outside of which it left one of its legs. A vigorous rhythmical contraction and expansion of the muscles of the severed leg took place, as a result of which a surprisingly loud creaking sound was emitted. It was produced by means of a stridulating organ, the structure of which was subsequently investigated. Near the base of the ventral side of the femur there is a minute transverse slit, the distal margin of which bears a row of outwardly directed hooks. The sound must be produced by these, but further investigation is needed, with fresh material, to show the surface against which the hooks rub when the muscles of the leg contract and expand, and the

[1] Specimens of this species often become brown in spirit, but in life the animal is very nearly white.

manner in which so minute an organ produces so loud a sound. Although similar organs can be detected on the legs that still remain attached, it was not found possible to induce the animal to stridulate in such a way as to produce an audible sound. It must, therefore, be supposed that the sound is only produced by detached legs—they are very easily detached—and that as they leap about squeaking they distract an enemy's attention from their owner, which slips away silently in the dark. Ridley has noticed that another species of *Scutigera* (*S. maculata*) that occurs in the Batu Caves appears to be quite harmless and does not attempt to bite when captured. It apparently feeds on cockroaches and other insects.

We have to thank Professor Silvestri and Mr. A. S. Hirst for naming several of the Myriapoda mentioned in our list.

ARACHNIDA.

Literature

1889. Thorell, *Ann. Civ. Mus. Genova* (2) VII (XXVII).
1889 (1890). Oates, *Journ As. Soc. Bengal* LVIII, p. 4.
1898. Ridley, *Rep. Brit. As.*, p. 580.
1898. Thorell, *Ann. Civ. Mus. Genova* (2) XIX (XXXIX), p. 279.
1900. Pocock, *Faun. Brit. Ind.*, *Arachnida.*
1901. Simon, *Proc. Zool Soc. London*, p. 76.
1912. Gravely, *Rec. Ind. Mus.*, VII, p. 107.

Among the Arachnida of the caves the Pedipalpi, of which one of us has made a special study, are of particular interest. We propose therefore to deal with them family by family in considerable detail.

PEDIPALPI.

Thelyphonidae.

Hypoctonus wood-masoni (Oates).

Gravely obtained a number of specimens of this whip-scorpion under stones close to the rocks at Dhammathat, and several in the Buddha cave at the same place. He also obtained the species on the eastern slopes of the Dawna Hills, and beyond them at Myawadi on the Siamese frontier. It was originally described from Mount Mulai-yit, south of the Dawna Range, and has also been found at Mitan in the Haung-tha-raw Valley. It has thus a wide distribution outside the caves, probably the widest yet known for any member of its genus.

The few immature specimens of *Hypoctonus* which were found in and around the Farm Caves probably belong to this species rather than to the Moulmein form, *H formosus*, Butler; for conditions at the Farm Caves resemble those at Dhammathat

more closely than those at Moulmein, and the Farm Caves do not appear to be separated from Dhammathat more completely than is Dhammathat from the next rocks in the direction of Mulai-yit or the Dawna Range.

?*Hypoctonus formosus*, Butler.

This species is said by Thorell to have been found by Fea in the Farm Caves (*Ann. Civ Mus. Genova* [2] VII [XXVII], p. 526), but he does not appear to have seen Oates' paper (*Journ. As. Soc. Bengal*, LVIII, 1889, pp. 4–19, pl. 11), in which the differences between *formosus* and other Burmese species had been described; nor does he appear to have noticed any such differences himself. Moreover, it is impossible to tell from his paper whether the specimens he saw from the Farm Caves were sufficiently mature to admit of specific identification.

Schizomidae.

Schizomus (*s. str.*) *cavernicola*, Gravely.

This species was described (*Rec. Ind. Mus.*, VII, 1912, p. 107) from specimens collected in the large Farm Cave, where they were found on moist soil with the Collembola on which they probably feed. Their antenniform legs are unusually long, but their eyes, which take the form of a pair of pale spots, are in no way remarkable. This is somewhat surprising as many non-cavernicolous forms are without recognizable eyes, while a species from Prome, on the other hand, has real eyes with a convex vitreous cornea.

One or two immature specimens of this family were seen under stones in a sheltered crevice of the rocks outside, but none of them were captured and we cannot say whether they belong to this species or not.

Tarantulidae.

The majority of the scorpion-spiders found in the caves belong to the interesting genus *Stygophrynus*, of which only two species have as yet been described. Both these species are cavernicolous; they are *S. cavernicola*, Thorell and *S. cerberus*, Simon. The former occurs in the caves of northern Tenasserim, the latter in those of Jalor.

The differences between the two species, though constant, are so small that in the absence of a good series of specimens of at least one of them their distinctness might well have been doubted. Consequently it is by no means improbable that the specimens from Saigon (*Bull. Mus. Hist. Nat. Paris*, 1901, p. 265) identified by Kraepelin as *S. cavernicola* before *S. cerberus* was known. will prove to belong either to the latter or to

a distinct species; for Saigon must be quite as completely separated from Khayon as Jalor is. Flower records the occurrence of "an animal allied to Phipson's Tarantula ..far into the caves" at Batu near Selangor (*Journ. Straits As. Soc.* July 1901. p. 40); doubtless this is also a *Stygophrynus*. Mr. Moulton has sent for examination a specimen of Tarantulidae from Klingkang, a limestone mountain range in Borneo. The great length of the femora of its antenniform legs suggests that it inhabits caves like *Stygophrynus*. It differs, however, considerably in the structure of the hand from the two known species of *Stygophrynus*, and may have to be made the type of a new genus There are also specimens of an undescribed species of *Stygophrynus* from Mentawei and Java in the Hamburg Natural History Museum.

Stygophrynus cavernicola, Thorell.

Thorell described this species from specimens obtained by Fea in the Farm Caves (*Ann Civ. Mus. Genova* (2) VII. (XXVII) 1889). It has since been obtained at the same place both by Annandale and by Gravely, while the latter found a few specimens also in dark corners of the small and well-lighted Buddha Cave at Dhammathat, but none in the long dark Guano Cave at the same place.

It lives chiefly on the walls of the darkest recesses and crevices of the caves, where it sits in the usual position adopted by members of its family when at rest, *i.e.* the body and walking legs lie flat against the support, the femora of the antenniform legs are folded over the back and directed inwards, while the distal parts of these legs are curled round above the walking legs. The femora of the arms (" pedipalps ") are directed a little backwards and upwards, not directly outwards as in the genus *Phrynichus*.

This scorpion-spider, like *Phrynichus*, seems to regard its extreme flatness as its best protection against ordinary enemies, and on the approach of a collector with a light it only clings the closer to its rock. As soon as any part of it is touched, however, it darts away forwards, backwards or sideways, with such rapidity that its course is often hard to follow, and then crouches in some fresh place When once disturbed to this extent it becomes more suspicious, and usually keeps its antenniform legs extended for a time. In these respects it so closely resembles species of the nocturnal but non-cavernicolous genus *Phrynichus* that it seems unlikely that the eyes of the two genera differ greatly if at all in the extent to which they are functional, though the exceptional length of the antenniform legs in *Stygophrynus* has presumably been developed to meet a need for increased sensibility to touch This may be due to the fact that their cavernicolous life practically limits their food

supply to insects of the sub-family Stenopelmatinae, which have enormously long and very sensitive antennae.

No ovigerous specimens of *S. cavernicola* appear to have been found, although Gravely made a special search for them and obtained a number of specimens which appear to be mature.[1] Probably the species breeds during the rains, as do *Charinides bengalensis* in Calcutta and the species of *Phrynichus* indigenous in Ceylon.

Stygophrynus cerberus, Simon.

Simon described this species from specimens obtained in caves in the neighbourhood of Biserat in the Siamese State of Jalor (*Proc. Zool. Soc.*, 1901, p. 76).

It is much more abundant than the Moulmein species, and is larger, darker in colour, and more heavily built. It is known to breed in May and June, the female carrying her eggs in a sac covering the lower surface of the abdomen as in other species of Tarantulidae. It resembles the Tenasserim species in its habits; both sexes sit on the walls of the caves in total darkness, with the femora of the antenniform legs crossed over their backs; they feed on the Locustid *Diestrammena annandalei*, which they catch with their arms, in spite of the fact that the insect is very active and is constantly feeling for the approach of enemies with its enormously long antennae.

Sections of the eyes have shown them to be pigmented and apparently well developed, but it is uncertain whether they are sensitive to light or not.

Catagius pusillus, Thorell.

Fea obtained the type of this species in the Farm Caves (*Ann. Civ. Mus. Genova* [2a] VII [XXVII] 1889, p. 531). Gravely has since obtained other specimens from the same place and from the Buddha Cave at Dhammathat. They live under stones, especially in the large Farm Cave, at the end furthest from the entrance; one or two immature specimens were found under stones in a crevice on the outside of the rocks. No ovigerous specimens have as yet been seen.

The antenniform legs are unusually variable in length; as a rule their femora are about twice as long as the carapace is broad, as in non-cavernicolous species; but in one or two specimens they are about three times as long as the carapace is broad, *i.e.* very nearly as long, in proportion to the size of the body, as in *Stygophrynus cavernicola*.

In addition to the Pedipalpi, a species of scorpion of the genus *Chaerilus* (stated to be new but not described) is recorded by Ridley from the Batu Caves; while three kinds of appar-

[1] At least one of them contains ova, apparently ready for extrusion.

ently cavernicolous spiders are known from different localities in Burma and the Siamese Malay States.

One of the spiders (*Talanites cavernicola*, Thorell) belongs to the family Drassidae. Thorell described this species from a single mutilated specimen obtained by Fea in the Farm Caves, and we believe it to be the one common on the floor of the large Farm Cave and of the Guano Cave at Dhammathat.

The other two spiders are Pholcids and spin webs among rocks in the caves, but it is very doubtful whether either of them is strictly cavernicolous; indeed, one of the two, which lives on the walls in the Farm Caves, is also found in the Karen Cheba Hills; this is *Althepus pictus*. Thorell. The other species (*Pholcus diopsis*, Simon) is only known from the caves of Jalor.

Several mites were found on the bat *Rhinopoma microphyllum* from the Guano Cave in Dhammathat, one of which has been referred by Warburton to the genus *Uropoda*.

CRUSTACEA.

Literature.

1898. Ridley, *Rep. Brit. As* , p. 581.
1902. Budde-Lund in Lanchester, *Proc. Zool. Soc.*, p. 379.

The only Crustacea recorded from the caves are two wood-lice, one described from Jalor and one recorded from the Batu Caves near Selangor. It is noteworthy that although the former (*Armadillo infuscatus*, Budde-Lund) is paler in colour than some species of its genus, it is no paler than one (*A. pallidus*) found in the jungle in the same district A blind wood-louse lives in the large Farm Cave (see above, p. 407, footnote 1)

SOME CONSIDERATIONS ON THE FAUNA.

It will be clear from the foregoing notes that no animal that has reached the heights of specialization in relation to a cavernicolous existence, has as yet been recorded from any of the limestone caves of Burma and the Malay Peninsula. Many blind or pubblind species are included in their fauna, and several that are provided with enormously developed organs of touch; but in both cases the species belong to genera or larger groups in which similar peculiarities are well, if not so well, developed in non-cavernicolous species. The very long antennae of *Diestrammena unicolor* or the equally long antenniform legs of *Stygophrynus cavernicola* are not peculiar to species that live in caves but are characteristic features of the groups to which they belong. An animal that lives in holes in the ground, or under stones or logs, from which it does not emerge by day-light, lives almost as much in the dark, and has almost as great a need for well-developed "feelers," as one that occupies the darkest recesses of a cave. It is in relation to a

furtive existence in the open that the sensory peculiarities of the Tarantulidae and the Stenopelmatinae have probably originated.

Nevertheless, a cavernicolous life is not in all respects identical with one spent in a small enclosed space, be it ever so dark. In a large cave conditions remain extremely equable throughout the seasons, there is room for active growth and movement, and those inhabitants of the cave which only frequent it by day (especially the bats) bring in with them from outside an abundant food-supply for animals that can flourish on the parts of their food indigestible to themselves. Thus the cavernicolous Orthoptera and Lepidoptera probably live, at one stage or another, largely on the remains of insects in the bats' droppings. These conditions encourage rapid multiplication on the part of the coprophils, and thus indirectly provide nourishment for actively predaceous animals such as *Stygophrynus*. It becomes the more necessary in the one case for the predator to possess organs of perception, in order that it may detect the presence of vigilant prey; in the other for the prey to possess similar organs whereby it may be warned of the approach of its enemy. Accordingly we find that in *Stygophrynus* and the cavernicolous species of *Diestrammena*, the striking peculiarities in the sensory organs possessed by their non-cavernicolous allies are exaggerated; for the antenniform legs of the Arachnid and the antennae of the insect are even longer and more delicate than is usually the case in their respective families.

The Pedipalp *Catagius pusillus* is of great interest from this point of view. Although adults have been found only inside the Farm Caves and the caves at Dhammathat, immature specimens have been taken under stones outside the former. The antenniform legs, moreover, although in some individuals nearly as long in proportion as those of *Stygophrynus cavernicola*, are as a rule much shorter, exhibiting a much greater variability in this respect than those of other species of the family. Unfortunately sufficient specimens have not been obtained to render a study of the exact nature of the variability possible.

As a general rule, among the groups represented in the Burmo-Malayan cave-fauna, colouration is more readily affected than structure by peculiar circumstances, and it is not surprising to find that this fauna includes a large proportion of unusually pale species or phases. In some cases (*e.g.* those of the moth *Crypsithyris spelaea* and the myriapod *Cambalamorpha feae*) it is probable that feebleness of pigmentation has become a specific character; while in others, especially in the cave-phase of the snake *Coluber taeniurus* and possibly in some strains of the mollusc *Prosopeas tchehelense*, paleness appears to be due to the direct effect on the individual of a

cavernicolous life. The question whether we are dealing here with two entirely different sets of phenomena, or merely with cases in some of which an individual peculiarity has become hereditary, can hardly be discussed without a consideration of the possibility of the inheritance of acquired characters. And sufficient evidence is not forthcoming.

In any case, there can be no danger in asserting that no species found in the caves of Burma and the Malay Peninsula is so highly specialized in correlation with this mode of life as are certain species found in the caves of Europe and North America. As a general rule the fauna of any given environment in a tropical country with an abundant rainfall is much richer in highly specialized forms than is that of a temperate climate. Why should the cave-fauna be an apparent exception to this rule? To answer this question it is necessary first to consider another, to wit, What cavernicolous forms are most highly specialized in the palaearctic zone? Many of them are aquatic species, *e.g.*, the Austrian salamander *Proteus* and the blind prawn of Kentucky, *Palaemonetes eigenmanni*. In these instances specialization mainly affects two features, colouration and the optic organs: the latter become degenerate or disappear, together with external pigmentation. It is improbable that any permanently aquatic animal occurs in any cave as yet investigated in Burma or Malaya. Other highly specialized (blind and colourless) cavernicolous animals are minute and inconspicuous and would only be found by more careful search than any that has yet been conducted in the caves of the Oriental Region.

In the great caves of Kentucky and Carniola, moreover, there are vast chambers separated by miles of total darkness from the light of day; these chambers and the passages that lead to and from them contain streams and lakes on which daylight never falls; whereas in the caves of Burma and Malaya there are no isolated waters, and long reaches of total darkness are of the greatest possible rarity; the holes produced by dripping water in the roofs of many of the largest caverns not only admit light but also provide a ready means of communication between the animals that have taken up their abode in the caves and their relatives that have continued to live a nocturnal and secretive life in the jungle on the surface of the hills. Opportunities for isolation are, therefore, of rare occurrence, and although isolation and specialization are not necessarily correlated, the former has undoubtedly played a very important part in the production of the peculiarities of faunas such as that of the Mammoth Cave.

Another interesting problem connected with the cave-fauna of the countries we are considering is that involved in the similarity of many of the species that occur in widely separated localities, but not, apparently, at any intermediate

point. Any statement as to this phenomenon must be qualified with an "apparently", for the invertebrates, which alone are concerned, of Burma and Malaya are still imperfectly known. But granted that it does occur even in a few instances, how has it come about? Why should *Stygophrynus cavernicola* be found only in the Farm Caves, at Dhammathat several miles away, and possibly in French Indo-China, many hundreds of miles away! Why should it be represented in the Jalor caves by another form hardly more than racially distinct? Are we to imagine that free intercourse took place between all these places at some previous geological epoch; or does it still take place, or has it been but recently interrupted, underground; or are we dealing not with real cases of specific identity but with instances of convergence? At present it is not possible to give a satisfactory answer to these questions.

APPENDIX.

1. *Note on clay tablets from a cave in Kedah.*

(Plate XVIII).

The inscriptions on the fragments of the clay tablet are not sufficiently distinct to be read fully and their subject to be ascertained certainly. From the letters which form a word and render sense, and are identifiable without doubt, my idea is that they contain something more than the usual Buddhist creed, the "YE DHARMĀ," etc.

As regards the age of the inscription, its script pushes it down the later part of the 7th century A.D. The letters which I have identified without doubt are eight in the large fragment and eight in the small one. The eight letters: MA, HĀ, VO, DHI, forming the word "MAHĀVODHI"; the initial in fourth line; and TA, THĀ, GA, TO, forming the word "TATHĀGATO" placed towards the end of the tenth line of the large fragment, resemble MA, HA, VA, DHA, TA, THA, GA, in table IV, column XVIII, XIX of G. Buhler's "Grundriss der Indo Arischen Philologie und Altertumskunde." And this is also the case with the other eight. In the small fragment the four distinct letters DHA, MA, HA, TA, forming word "DHA (R) MA H (E) T (U)" in the beginning of the first line and TA, THĀ, GA, TO, forming the word "TATHĀGATO," in the fourth line appearing after the first letter, are similar to those of the large fragment. Dr. Buhler's letters in table IV and under columns XVIII and XIX are, according to his own statement, of 675 A.D., and belong to the alphabet of that period which is called the Kuṭila variety of the Magadha alphabet of the 7th century A.D. Consulting the facsimiles of the inscriptions of that period, I find that the letters I identified in the tablets are allied to those in the

inscriptions of Ādityasena and Jīvita Gupta II published by Dr. Fleet in his Corpus, Vol. III. The letters TA, THA, VA, GA, DHA, HA agree with those in Ādityasena's Aphsad stone and Shapur image inscriptions; while the 'MA' agrees with that in Jīvita Gupta's Deo-Baraṇārk stone.

The rest of the characters, which I did not gather from the tablets as I could not make any sense of them, appear akin to the same inscription. For instance it may be noted that "YA", the first letter in the second line, "LA", the third letter counting from the right side in the sixth line of the large fragment, and VI, PU, LA, the three letters occurring after two letters in the second line of the small fragment, conform to those characters in the said inscription. Moreover the mode of affixing vowels to the consonants agrees throughout with that of the said inscriptions.

B. B. Bidyabinod.

2. *Note on clay tablets from caves near Moulmein.*[1]

(Plate XX).

This representation of Gotama seems to be peculiar to the Burmese, the Shans and the Siamese. It is called in Burma a "Zabupade"; it always represents the Buddha in full regal dress; the head-dress is often, as in these tablets, a three-tiered crown surmounted by a pointed ornament; on both sides, attached to the crown, are appendages or wings; from the large holes in the lobes of the ears depend two ear ornaments the ends of which touch the shoulders, both arms have large armlets; the dress appears to be richly embroidered, with side ornaments at the shoulders.

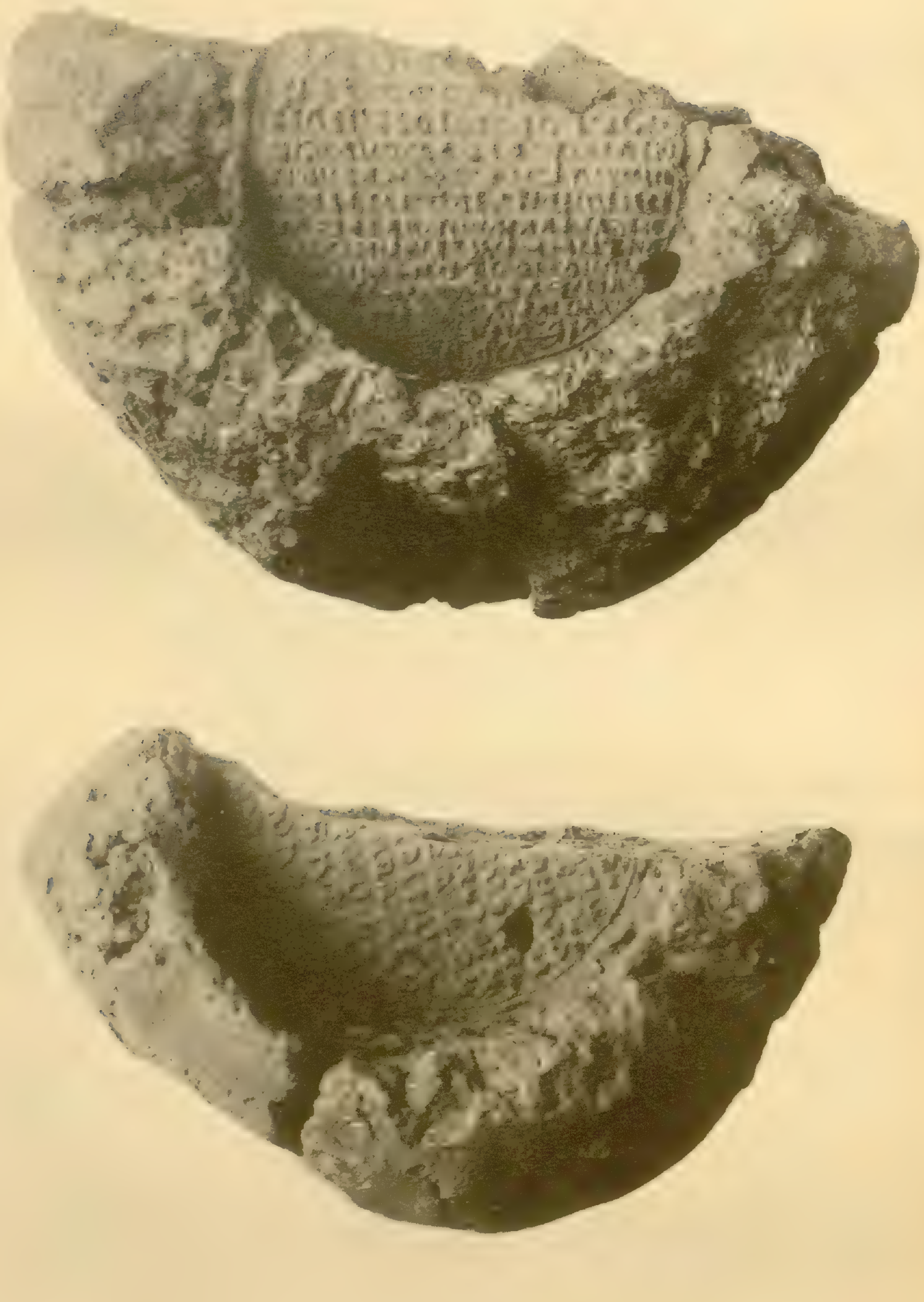
It is called Zabupade (Pali: Jambupati) because, it is said, there was once in India a king, Jambupati by name, exceedingly proud and fond of rich dress; the Buddha, to curb his pride and vanity, assumed miraculously a regal dress in comparison with which the king's was simplicity itself, and preached to him a sermon on the vanity of the things of this world. It is to commemorate this event that the Buddha is thus represented.

From the general appearance of the figures, the tablets seem to be of Shan or Siamese origin. There have always been many Shans in this part of Burma, and wars between the Burmese and Siamese have been frequent; this would explain the presence of Shan or Siamese images in the Talaing country.

These tablets appear to be not earlier than the 18th century A.D.

C. Duroiselle.

[1] The specimen figured, which is now in the Indian Museum, is from the Buddha Cave at Dhammathat and not, as stated on the plate, from the Farm Caves. The specimen found in the Farm Caves bore the same design, but was broken in two and was more strongly weathered.



Bemrose, Collo Derby.

ENLARGED PHOTOGRAPHS OF FRAGMENTS OF
CLAY TABLETS FROM A CAVE IN KEDAH.

Specimens in the Raffles Museum, Singapore.

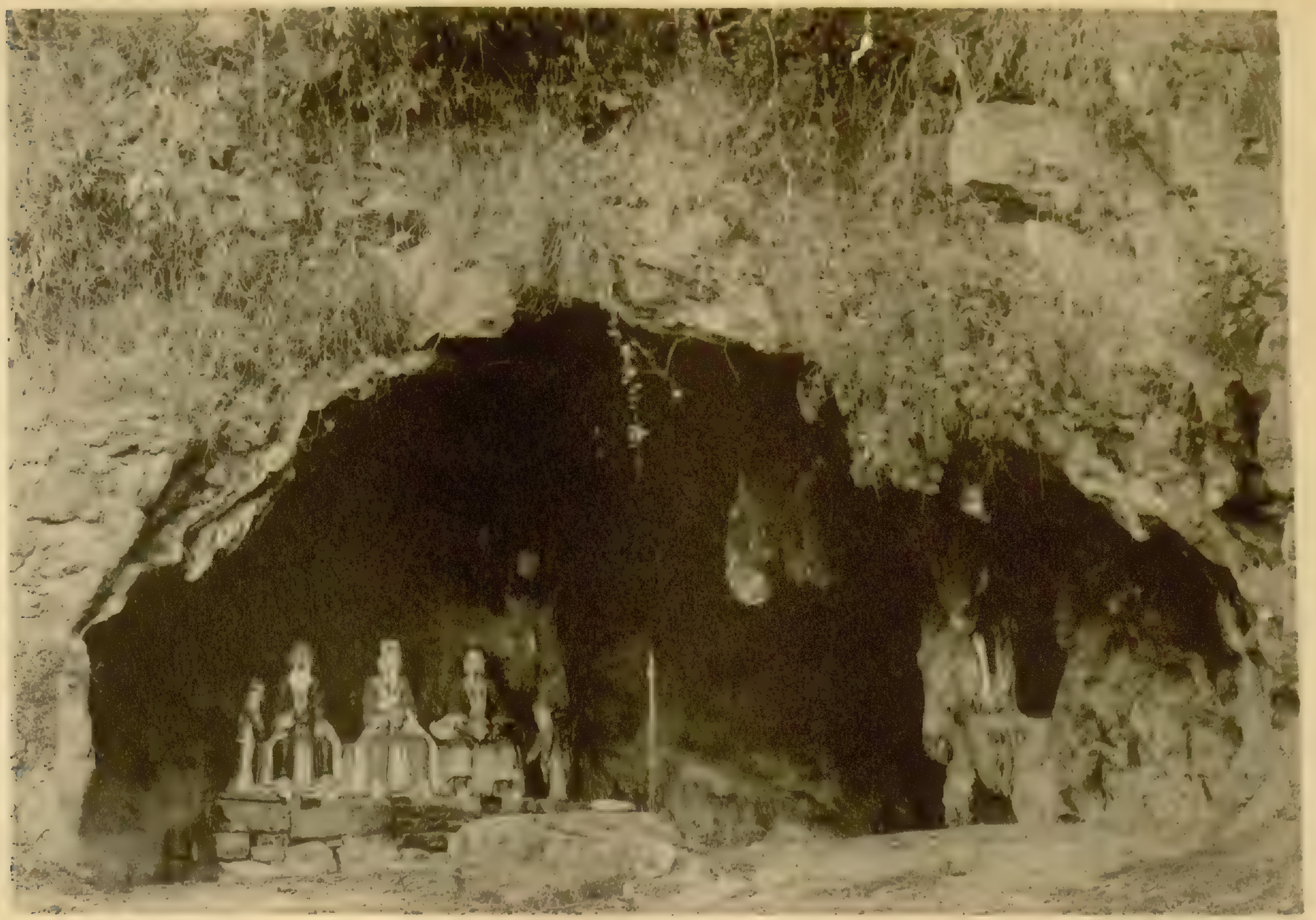
Bemrose, Collo. Derby

CLAY TABLET FROM A CAVE IN PAHANG.

Specimen in the Raffles Museum, Singapore.

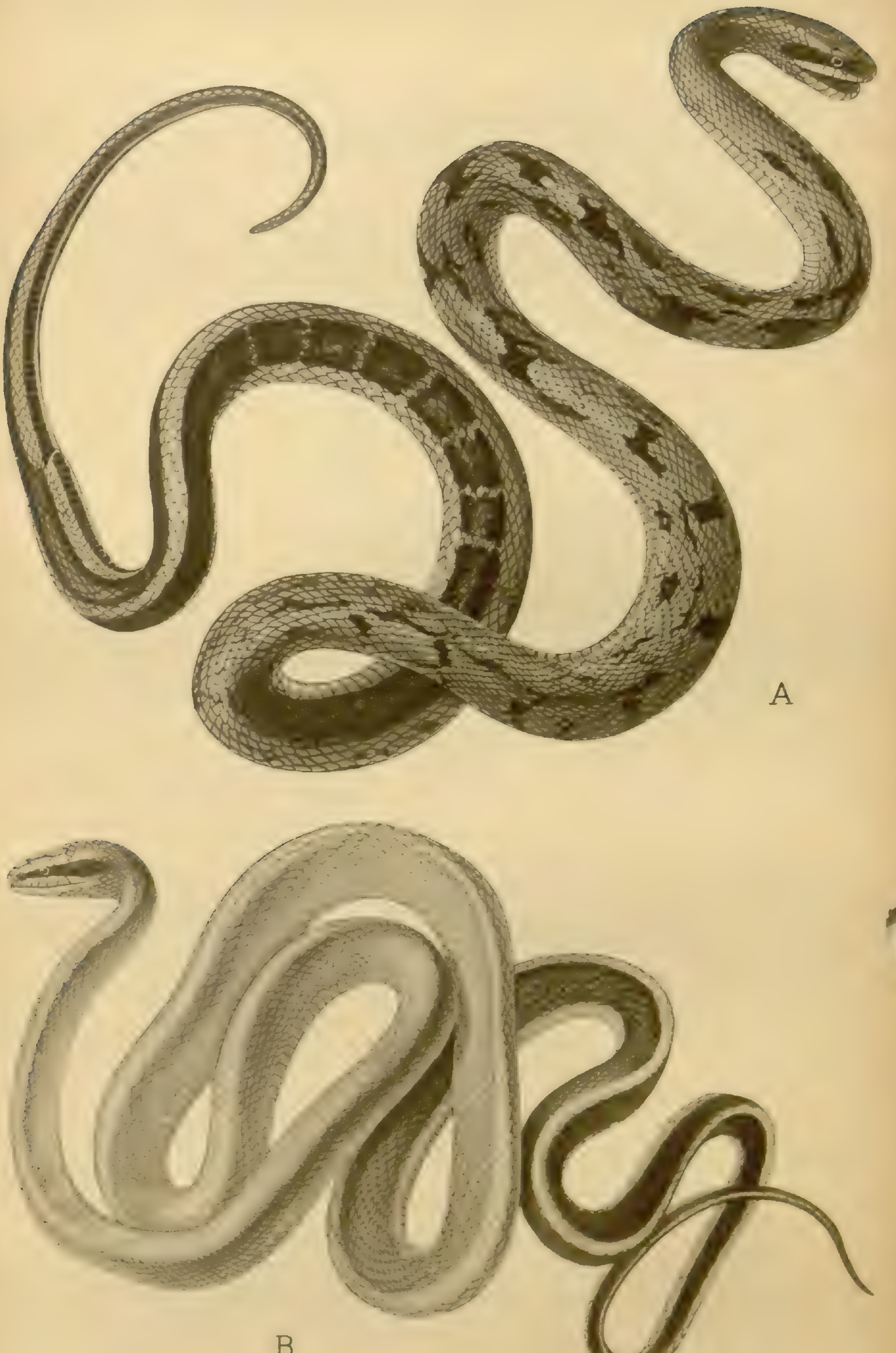
Bemrose Colle Derby

CLAY TABLET FROM THE FARM CAVES NEAR MOULMEIN.



J. Coggin Brown, Photo. Bemrose, Collo. Derby

IMAGES AT ENTRANCE TO CAVE IN LOWER CARBONIFEROUS LIMESTONE
TA-SHIH-WO, YUNG-CH'ANG FU PREFECTURE, YUNNAN, CHINA.



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COLUBER TAENIURUS (COPE)

45. The Preparation and Decomposition of Monochloro and Dichlorobenzylamines.

By Rasik Lal Datta.

The interaction of dichlorocarbamide with both aliphatic and aromatic amines was studied in brief in a paper to the Chemical Society (*Trans. Chem. Soc.* 1912, 101, 166), when it was shown that dichlorocarbamide is essentially a chlorinating agent, behaving analogously to hypochlorous acid. The products of its interaction with amines are both monochloro and dichloro derivatives with the primary ones, and monochloro with the secondary ones. The chlorination proceeds quietly without any hydrolysis with the higher members, while with the lower members the chlorination is accompanied by brisk hydrolysis resulting in the evolution of gases. The reaction was specially studied with benzylamine, which, according to the proportions of dichlorocarbamide, gave both monochloro and dichlorobenzylamines.

The original method of obtaining these chloramines depends upon the action of sodium or calcium hypochlorite on amines (Berg, *Compt. Rend*, 1893, 116, 327),—in fact this was the only method known. The present method is almost as simple, yielding, moreover, a purer product. In order to prepare the monohalogen derivative, benzylamine must be kept in excess while the reverse must be the method in the preparation of dichloro-derivatives. In both cases, the reaction takes place almost quantitatively, unaccompanied by the least hydrolysis. To ensure this, the operation is conducted in the cold.

The chief interest lies in the spontaneous decomposition under water of monochlorobenzylamine, a viscous liquid, which is conveniently extracted with ether from the reacting mixture of dichlorocarbamide and benzylamine. A portion of this viscous liquid was kept under water in order to ascertain whether slow but persistent hydrolysis does take place. In a few days the viscosity had greatly diminished, and a distinct smell of benzaldelyde was noticed. The now mobile layer of liquid underneath the water was separated by means of a separating funnel and was found on examination to be pure benzaldelyde.

Dichlorobenzylamine is obtained by the above method by adding an excess of dichlorocarbamide to benzylamine. This body is less viscous than the monochloro derivative and can be conveniently separated by a separating funnel. It is much more stable than the monochloro derivative and on keeping it under water as before, at first no appreciable hydrolysis seemed

to take place, for the valuation of halogen after the lapse of some days showed that the substance had remained intact :—

·3474 gave ·5470 Ag Cl : Cl = 38·95.

Calc. for $C_6H_5.CH_2.NCl_2$: Cl = 40·34.

It was seen, however, that after the lapse of a long time hydrolysis had indeed taken place, benzaldelyde being as before a product.

On the other hand, when dichlorobenzylamine was left in a stoppered bottle for a few days, it was found that small crystals made their appearance on the sides of the bottle in contact with the liquid. On opening the stopper, a pressure was felt from within, and besides the smell of this compound, a distinct smell of free chlorine was noticed. The bottle was stoppered again and allowed to remain, the pressure being released from time to time ; the whole liquid ultimately solidified into a mass of crystals, which on examination was found to be benzoic acid. The reaction is explainable thus :—

$$C_6H_5CH_2NCl_2 + O_2 = C_6H_5.COOH + HCl + N + Cl.$$

the oxygen required for the reaction being evidently obtained from air confined in the bottle. The above equation necessitates the liberation of nitrogen which could not be detected under the above circumstances.

It is important to note here that just as the pseudohydrolysis of benzylamine gives benzyl alcohol, so the hydrolysis of monochloro and dichlorobenzylamines should give benzaldelyde and benzoic acid, respectively—an anticipation which was verified.

My thanks are due to Professor P. C. Rây for his encouragement in carrying on the above investigation.

46. India in the Avesta of the Parsis.

By Shams-ul-ulma Dr. Jivanji Jamshedji Modi, B.A., Ph.D.

Anquetil Du Perron, the great French scholar, having seen a few stray pages of the Avesta writings in his country, had come to this country as a soldier-adventurer to study that language, and, after passing through this city, had gone and settled at Surat, the then head-quarters of the Parsis. Having studied the Zend Avesta there for some years, he returned to France and published in 1771 his Zend Avesta, containing the French translation of the Scriptures of the Parsis. Sir W. Jones was the first to run him down, as one duped by the Parsis of Surat. He said that the Avesta books he had brought to the notice of scholars in Europe were not genuine and were a fabrication of the priests. The late Prof. James Darmesteter, a talented country-man of Anquetil Du Perron, who has for the first time translated into English a large part of the Avesta from the original itself, thus speaks of the dispute: "A violent dispute broke out at once, as half the learned world denied the authenticity of the Avesta, which it pronounced a forgery. It was the future founder of the Royal Asiatic Society, William Jones, a young Oxonian then, who opened the war. He had been wounded to the quick by the scornful tone adopted by Anquetil towards Hyde and a few other English scholars: the Zend Avesta suffered for the fault of its introducer, Zoroaster for Anquetil..... It is true that Anquetil had given full scope to satire by the style he had adopted: he cared very little for literary elegance, and did not mind writing Zend and Persian in French; so the new and strange ideas he had to express looked stranger still in the outlandish garb he gave them."[1] Summing up the result of the long dispute on the subject, Darmesteter says: "Modern scholarship..... came to that twofold conclusion, that, on the one hand, Parsiism was one of the elements out of which Mohammed formed his religion, and, on the other hand, that the old religions of India and Persia flowed from a common source."[2] Kleuker and other distinguished scholars had, one after another, upheld the work of Anquetil and showed that the Avesta books he had discovered were genuine. Some of them in showing this, took the help of the Sanskrit language, of the scientific study of which Sir W. Jones had

[1] S.B.E., Vol. IV (1880), pp. xv-xvi.

[2] Ibid., p. xvii.

laid the foundation. Had Sir William Jones himself lived long, he would have soon corrected his somewhat hasty conclusion, for which, one must say, the translations of Anquetil themselves were, to a certain extent, responsible, because, though they did all credit to him as a great scholar, they were after all crude. Sir W. Jones had no opportunity to see the Avesta books here in Calcutta. where there were very few Parsis at the time, though he had studied the later Persian Literature that bears some connection with the Avesta books.

Prof. Darmesteter thus speaks of the Avesta: "The Zend-Avesta is the sacred book of the Parsis, that is to say, of the few remaining followers of that religion which reigned over Persia at the time when the second successor of Mohammed overthrew the Sassanian dynasty..... ..... In less than a century after their defeat, nearly all the conquered people were brought over to the faith of their new rulers, either by force, or policy, or the attractive power of a simpler form of creed. But many of those who clung to the faith of their fathers, went and sought abroad for a new home, where they might freely worship their old gods, say their old prayers, and perform their old rites. That home they found at last among the tolerant Hindus, on the western coast of India and in the peninsula of Guzerat..... As the Parsis are the ruins of a people, so are their sacred books the ruins of a religion. There has been no other great belief in the world that ever left such poor and meagre monuments of its past splendour. Yet great is the value which that small book, the Avesta, and the belief of that scanty people, the Parsis, have in the eyes of the historian and theologist."[1]

In this short paper, I want to collect those passages in "that small book, the Avesta," which refer to the land of "the tolerant Hindus," who kindly gave to the Parsis the hospitality of a "home."

The Indians and the Irânians, forming the two most important branches of the Aryan or the Indo-Irânian stock of people, knew something of each other's country from very remote times. References to the Irânians of the Parthian dynasty of Persia are found in Manu[2] (X, 43-44) and in Natrya-shâstra (XXV, 89). They are spoken of as Pahravas. These Pahravas, Pallavas or Pahlavs are the Arsacidian Parthians. A dynasty of that name had long ruled in India even up to the country of Mysore in the South. The Chalukyas are the opponents of these Pahlavs. They are supposed by some to be the same as Salukians or the followers of Selucus, the general of Alexander the Great. If so, we see in this opposi-

[1] Ibid., xi-xii.

[2] "Institutes of Hindu Law or The Ordinances of Menu," by W. Jones (1794), p 294.

tion another instance of the constant struggle of the Greeks and the Persians for the supremacy in the East. The coins of the Pahlavas were found in the dominions of Kanishka, a Buddhist king, because they lived in his extensive dominions. These coins had the name of Avesta deities on them.[1]

Râdjatarangini, the History of Cashmir,[2] refers to some Gandhara Brahamins (गान्धारा ब्रह्मण) of the Mlechha dynasty (मळेच्छ वंश) in the reign of a king Mihira Cula, the Mirkhul of the Âin-i-Akbari. This Mihira Cula is depicted by the author of the Râdjatarangini as a wicked king in whose reign the Mlechhas had an ascendancy. He had founded a temple of Mihiréswara and the city of Mihirapur "in which the Gandhâr Brahmans, a low race.....were permitted to seize upon the endowments of the more respectable order of the priesthood.[3]

While travelling in Cashmere some years ago, a learned Pandit of Shrinagar told me, that the Gandharva Brahmans referred to in the Râdjatarangini were Zoroastrian Mobads or priests. Some other statements in the Râdjatarangini[4] about them seem to confirm this identification. These references to the Zoroastrians of Persia show that India knew Irân from very old times. Similarly, we learn from the Avesta that Irân knew India from very remote times.

To the Irânians of the times of the Avesta, the then known world consisted of five countries. These are mentioned in the Farvardin Yasht which is, as it were, the canon of the ancient Zoroastrians. It contains the names of the ancient Irânian saints whose Farohars or good spirits are invoked in prayers. In it,[5] the saints of the following five countries are invoked:—

1. Airyanâm dakhyunâm, i.e. the country of the Airyas.
2. Tuiryanâm dakhyunâm, i.e. the country of the Turânians.
3. Sairimanâm dakhyunâm, i.e. the country given to Selam by king Faridun—the country of Rum, or Asia Minor and Eastern Europe.
4. Sâniniâm dakhyunâm, i.e. the country of China.
5. Dâhinâm dakhyunam, i.e. the country of the Dahæ, a people of Central Asia.

[1] *Vide* "Zoroastrian Deities on Indo-Scythian Coins. (Indian Antiquary, Vol. XVII, Part CCVII). *Vide* Mon. E. Druin's Paper, entitled "Le Nimbe et les Signues de l'Apothéose sur les Monnaies des rois Indo-Scythes" (Revue Nummismatique. Quatrièmme Sèrie, Tome V, deuxième trimestre 1901).

[2] *Vide* my paper on "Cashmere and the ancient Persians," B.B.R.A.S. XIX, pp. 237-248.

[3] Asiatic Researches XV, p. 28.

[4] Bk. I, slokas 306-309.

[5] Farvardin Yasht (Yasht XIII, 144).

Of these five, India was included in the first, the country of the Airyas or Âryas. As to this first country, the country of the Airyas, sixteen countries or cities are included in its catalogue, the first being Airyana-Vaêja, or the Irân Vej, the Irân proper of the early Irânians, or, what can be called the Âryavrut of the Irânians, as India is the Âryavrut of the Hindus. India forms a part of the country of the Airyas named in the Farvardin Yasht.

Coming to the question of the direct references to India itself in the Avesta, we find, in all, four references. They are the following :—

I. The Vendidâd, Chap. I, 19.
II. Yaçna (Sarosh Yasht) LVII, 29.
III. Meher Yasht, 104.
IV. Tir Yasht, 32.

I. Of these four, the first, viz. the reference in the Vendidâd, seems to be the oldest and the most important. The passage runs thus :—

Panchadasem asanghâmcha shôithranâmcha vahishtem frâthweresem, azem yô Ahurô Mazdâo yô Hapta-Hindu, hacha ushastara Hindva avi daoshatarem Hindûm. Âat ahê paityârem frâkerentat Angrô Mainyush pouru-mahrkô arathwyâcha dakhshta arathwîmcha garemâum.

Translation.—I, who am Ahura Mazda, created, as the fifteenth best place and country, (the country of) Hapta Hindu, (which extends) from the East of the Hindu (river, i.e. the Indus) up to the West of the Hindu. Then, the evil spirit created therein, as a counter-act (against its excellence) excessive menstruation and excessive heat.

We learn from this passage of the Vendidâd the following facts about India :—

(1) That India was the fifteenth of the 16 Âryan countries, known to the early Iranians as created or blessed by God.
(2) It was known as Hapta Hindu.
(3) The country watered by the Indus formed India, and its boundary latterly extended further both ways, towards the East and the West.
(4) It had, as it were, two curses or miseries associated with it. Let us now examine these facts.

1. Firstly, let us consider, why is India spoken of in the Vendidâd as the 15th country? The answer to this question is connected with the question, as to what the first chapter of the Vendidâd is a record of. Baron Bunsen, Rhode, Lassen, Haugh and others thought, that the 16 places, mentioned in the Vendidâd, were those to which the ancient Âryan or the Indo-Irânian race migrated one after another. Others, like Dr.

Spiegel, thought, that this chapter only contained a list of the countries known to the ancient Irânians. Prof. Darmesteter took it merely as "a geographical description of Iran." I think, that the chapter contains an enumeration of the countries which were occupied, one after another, by the ancient Irânians, and in which the ancient Mazdayacnân religion prevailed to a more or less extent. The very beginning of the chapter helps us to say so. It runs thus :—

"Mraot Ahuro Mazdâo Spitamâi Zarathushtrâi azem dadhâm Spitama Zarathushtra aso râmô-dâitîm noit kudat-shâitîm. Yedhi zî azem nôit daidhyâm Spitama Zarathushtra asô râmô-dâitîm nôit kudat-shâitîm vîspo anghush astvâo Airyanem Vaejô frâshnvât.

Translation.—Ahura Mazda said to Spitama Zarathushtra: O Spitama Zarathushtra! I have created (all) countries as pleasure-giving countries (i.e. as (countries) giving pleasure to its inhabitants), and not as pleasure-destroying (countries). O Spitama Zarathushtra! Had I not created (all) countries to give pleasure to its inhabitants, but had created them as destructive of pleasure, then the whole of the living world would have crowded in the country of Airyana Vaeja (Irânvej).

The gist of the chapter seems to be this: God has created all countries for the pleasant abode of men. He had no idea of adding any discomfort. But circumstances have connected some kind of discomfort or evil with all countries. For example, even Irân, which is mentioned as the first chosen land of God, though beautiful and enjoyable in all matters, has the disadvantage of being excessively cold and of being infested with large snakes After creating Iran, as the first of the inhabitable countries, God went on creating other countries one after another. Had not God thus made inhabitable other countries, all human population would have thronged at, and crowded Irân. Thus, one after another, as one city or country got overcrowded, another was created and made habitable. All such countries had with their advantages, one or another disadvantage or complaint attached to them. India was the fifteenth country in the list, and the disadvantages attached to it were, (*a*) that it was excessively hot, and (*b*) that there women had to pass through the state of menstruation at a very early age of life.

The sixteen countries named in the Vendidâd are the following :—

Names in the Avesta		*Modern names.*
1. Airyana Vaêja	.. ..	Irân.
2. Sugdha (Sogdiana of the Greeks)	..	Samarkand
3. Môuru ..	.. ..	Merv.
4. Bâkhdhi ..	.. ..	Balkh.

5. Nisâya	.. ..	.. Nishâpur.
6. Harôyû	.. ..	.. Herat, or the country of the Herirud river.
7. Vaêkêrêta	.. ..	.. Nimrouz or Seistan.
8. Urva	.. ..	.. Kabul.
9. Veharkâna	.. ..	Gourgân.
10. Harakhaiti	..	.. Sarasvati.
11. Haêtument	.. ..	.. Helmand.
12. Ragha	.. ..	.. Rae
13. Chakhra	.. ..	.. ..
14. Varêna	.. ..	.. Gilan.
15. Hapt-Hindu	.. ..	.. India.
16. The country near Rangha		.. ..

Scholars differ on the question of the identification of some of these countries. However, the order of the countries shows, that all the 14 countries preceding the mention of India are on the West of India. India, being in the further East, is mentioned well-nigh last. The identification of the 16th country is very doubtful. Anyhow, we see that India is one of the countries known to the ancient Irânians. Later books, which, if not truly historical, are semi-historical, speak of India being at times under the sway of the pre-Achemenian Irânians. So, we may take, that India is named in the list of the countries as one under the territorial sway of the ancient Irânians.

2. The second fact that we learn about India from the above passage of the Vendidâd, is that it was known as Hapta-Hindu. This fact is very striking. The Hapta-Hindu of the Vendidâd is the Sapt-Sindhu of the Vedas. The word shows that India was known to the Persians from the oldest times, when the Indus had seven branches and not five, which have given the country through which it flows, its later Persian name of Panjâb. The seven branches were the following :—

Vedic names.	Greek names.	Mahâbhârata names.	Modern names.
Sindhu ..	Indus ..	.....	Sindhu.
Vitastâ ..	Hydaspes ..	Vitastâ ..	Jhelum.
Asikani ..	Akesinis ..	Tchandrabhaga	Chenaub.
Parushani ..	Hydraortes ..	Airavati ..	Râvi.
Vipas ..	Hyphasis ..	Vipasa ..	Biyâ.
Satadhru ..	Hesydrus ..	Satadru ..	Sutlej.
Kubha ..	Kophen ..	.....	.....

It looks strange, but it is a fact, that the country of India and its people were known to the ancient Greeks and are even

now known to the moderns including the Hindus themselves, by their Iranian names. The indigenous Vedic name of the country, through which the Indus (which has given its name, India, to the country) flows, is Sapt Sindhu. So, the country ought to have been known by the name Sindhustân and not Hindustân which is a form of the old Irânian name. The river has preserved its old Indian name, viz. Sindhu, but the country has taken its Irânian name Hindu (Hindustan). The ancient Greeks who began to know India through Persia, and all the other Westerners, knew this country and know it even now, by its Irânian name.

The Greek name of one of the branches of the Indus, viz. the modern Jhelum (Vedic Vitastâ), is Hydaspes. This name is Irânian. The word "aspes", which forms the second part of the name, is Avesta "aspa", corresponding to the Sanskrit अश्व (Ashva), Latin 'equus,' horse. We find the word in the Avesta and Greek names of another Persian river also. It is the Hvaspa of the Avesta,[1] the Choaspes of the Greeks, the modern Cherkheh. Unfortunately, we have not in the extant Avesta the names of the seven branches of the Indus. But this Greek name of one of the branches shows that the branch was named by the Greeks after its Irânian name. Similarly, the main river and the country itself were named after their Irânian names.

In the Sassanian times of the later Pahlavi commentators of the Avesta, the Indus having only five branches, the commentators were at a loss to know why the country was called Hapt-Hindu. So, they seem to have ingeniously discovered another reason for the name. They said: "Avash hapt-Hindukânih hanâ âigh sar-khudâ haft ait,"[2] i.e. it is called Hapt-Hindu, because there are seven rulers over it. Possibly there were seven rulers ruling over the land of the Indus at the time.

As stated by Dr. Haug, at least two facts lead to show that the Vendidâd, in which the name of India occurs as Hapt-Hindu, was written many centuries before Christ.

Firstly, we learn from Herodotus,[3] that Deioces of Media had founded Ecbatana (Agabatana, Hamdan). That was in B.C. 708. This great city of ancient Persia is not mentioned in the above list of the cities of the Vendidâd. This fact, therefore shows that the Vendidâd, or at least this chapter of the Vendidâd, was written long before B.C. 708.

Secondly, the city of Balkh, which is named as Bâkhdhi in the Vendidâd, is spoken of there as the city of "Eredhvô-

[1] Zamyâd Yasht, 67. *Vide* my paper on the river Karun (Asiatic Papers, pp. 1-22).

[2] Spiegel's Text of the Pahlavi Vendidad, p. 7. l. 1.

[3] Bk. I, 98.

drafshâm," i.e. the city of the exalted drapeau." This statement shows that it was still at that time the capital city of Bactria, carrying the royal banner. Now, we know, that Bactria fell into the hands of the Assyrians at about B.C. 1200. So then, this particular chapter (Chap. I) of the Vendidâd must have been written long before B.C. 1200, when its exalted banner fell at the hands of the Assyrians. These facts then show, that India was known to the ancient Irânians as Hapt-Hindu, i.e. as "the country of the seven rivers of the Indus," a long time before 1200 B.C.

3. Coming to the third fact, we find that the country of India, as first known to the Irânians, before about 1200 B.C., was only the country of the Indus. Latterly, the boundary seems to have extended both ways. This fact appears from a sentence in the above chapter of the Vendidâd, which, as it were, gives the eastern and the western boundary of the Hapt-Hindus. It says, "Hacha Ushastara Hindva avi Daoshatarem Hendum," i.e. the country of Hindustan, extends from the East of the Indus to the West of the Indus. This sentence is not found in some of the old manuscripts of the Vendidâd.[1] So, it seems, that it is a later addition by way of a comment. The later Pahlavi rendering of the Vendidâd gives the comment thus: "Hacha ushastara Hendva avi daoshastarem Hendum."[2] The above Avesta passage and this Pahlavi rendering have well nigh the same phraseology. So, it appears that the Avesta sentence is a later addition by a commentator Anyhow, what we find from this passage is this: At first, it was only the country watered by the Hindu (Indus) that was known as the country of Hindustan (India), but latterly gradually, the country both on the west and the east of the country so watered by the Indus was included in the name Hindu or India.

4. Lastly, we come to the question of the curse on the country. The Vendidâd associated some evil, misfortune or curse with all the sixteen regions mentioned in its list of the Aryan cities. Ahura Mazda or the good spirit created them as pleasure-giving abodes for men, but the evil spirit produced some kind of evil to mar their pleasures. In the case of India, the evil was twofold. Its people had to bear too excessive heat and its women had to pass through a period of menstruation at a very early period of their life. We know that this is true of India even now.

Having examined the four inferences that can be drawn from the passage of the Vendidâd which is the first and the

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[1] *Vide* Westergaard's Text, p. 346, note 5 to para 19, where he says "K_2, K_6, R omit these six words hacha.. ...Hindum."

[2] Spiegel's Text, p. 7, l. 3.

principal reference to India in the Avesta, we will now look into the other references.

II. The reference to India in the Yaçna (LVII, 29) runs thus :—

"Yatchit ushastairê Hendvô âgeurvayêitê yatchit daoshtairê Nignê."

Translation—Who goes from Hindustan in the East to Nineveh in the West.

Here Sraosha, the Yazata or Angel presiding over Obedience, is represented as marching in his chariot of swift horses, from the East to the West. India (Hindva) is here represented as the Eastern boundary and Nineveh as the Western boundary of the then known Irânian country. Scholars differ as to the meaning of the last word *nigné*. Some do not take it to be a proper noun. Darmesteter takes the eastern boundary to be the river Indus, and the western the river Tigris. But we need not enter into the question of settling the meaning of the last word. Suffice it to say for our purpose, that the Yaçna speaks of India as the eastern boundary of the territories of the country of Iran.

III. The reference to India in the Meher Yasht (104) runs thus :—

Mithrem vouru-gaoyaoitîm yazamaidê .. .. yenghê daregâchit bâzava fragerewenti mithrô-aojanghô, yatchit ushastairê Hindvô âgeurvayeiti yatchit daoshatairê Nignê.

Translation—We invoke Mithra of wide pastures ..... whose extended arms help that person who adheres to his promise (mithra), whether that person be in Hindustan in the East or Nineveh in the West.

The Meher Yasht treats of Mithra, the Yazata or Angel of Light, who is believed to preside over "truthfulness." He helps those who truthfully adhere to their promises, whether they happen to be in India in the East or Nineveh in the West. The phraseology being the same as that in the Yaçna, the inference also is the same.

From the above two references of the Yaçna and the Meher Yasht, we find the following two facts :—

1. Firstly, they have dropped the word Hapta or seven from the name of the country and no longer speak of it as Hapta-Hindu, but speak of it only as Hindu. This shows, that latterly, the name Hindu or India was not confined to the country watered by the Indus but was extended to regions other than this.

2. Secondly, the rule of Persia extended at the time from Nineveh in the West to India in the East.

IV. The last reference to India in the Avesta is that in the Tir Yasht (32). It speaks not of India itself but of one of its mountains—the Hindukush. The passage runs thus :—

"Âat tat dunmân hâm-hishtenti us Hindvat paiti garôit."

Translation—Then vapour arises from the mount Hindu.

Tistrya is the Yazata or angel presiding over rain. So, in the Yasht which treats of an account of this Yazata, the watery vapour which forms rain, is referred to as arising from Mount Hindu, which is identified with the Hindukush.

47. The Twelve Bhuiyas or Landlords of Bengal.

By the Rev. H. Hosten, S.J.

This subject of the Bārah Bhūiyās of Bengal was first touched upon by Fr. Wilford in *Asiatick Researches*, xiv, 451. "The kings of Ārācan and of Camillā were constantly striving for the mastery, and the former even conquered the greatest part of Bengal; hence, to this day they assume the title of lords of the twelve Bhūniyās, Bhattis, or principalities of Bengal."

Prof. Blochmann wrote in *Contributions to the Geography and History of Bengal*, Calcutta, 1873, p. 18: "Muhammadan historians call the coast strip from the Hūglī to the Megna 'Bhātī,' or 'low land subject to the influx of the tide,' and even nowadays this name is very generally used. The sovereignty of this district, according to the Akbarnāmah and the Rājah Pratāpaditya legend, was divided among twelve chiefs; and Col. Wilford, whatever may have been the source of his information, says that....[*ut supra*]."

Dr. J. Wise pushed the subject considerably further in *J.A.S.B.*, 1874, p. 197 et sqq.; 1875, pp. 181-183: and Mr. H. Beveridge offered some other important elucidations in *J.A.S.B.*, 1904, pp. 57-63.

Dr. Wise quoted among his authorities (1874) the Latin edition of du Jarric. We shall translate presently two passages from the original French edition, the source of du Jarric's information being letters received by Fr. Nicholas Pimenta, S.J., from Jesuit Missionaries in Bengal (1599). "This country of Bengala, which comprises about two hundred leagues of seacoast, was inhabited partly by native Bengalis, who are generally Pagans, partly by Saracens, for the most part Patans or Parthians [Persians], who, having been driven from the Kingdom of Mogor, which they had seized upon, withdrew to this country, where they established themselves under the government of a king of theirs; shortly after, however, the Mogors attacked them, and, having killed their king and the chief of their leaders, they took themselves possession of the country.[1] They did not keep it long, however; the twelve Lords, the governors of the twelve kingdoms, which the said king of the Patans possessed, leagued together, dispossessed the Mogors, and usurped each the state which they governed; so much so that they are now sovereign lords and acknowledge no one

1 Allusion to the events of 1576.

above them. Yet, they do not call themselves kings, though they consider themselves such; but, Boyons, which means perhaps the same as Princes. All the Patans and native Bengalis obey these Boyons: three of them are Gentiles, namely those of Chandecan, of Siripur, and of Bacala. The others are Saracens; however, the King of Aracan, called King of the Mogos, also holds part of it." Cf. *Hist. des choses plus memorables* . . . ., Bovrdeavs, 1614, Vol. III, 826-827.

In Vol. I, 602, we find: "The great Mogor attacked them with a powerful army, and having killed the tyrant [King Dāūd], who had usurped this country, with his chief partisans, he left the government of that kingdom in the hands of twelve persons, who plotting secretly against him subdued those of Mogor, and are at present very powerful lords, especially those of Siripur and Chandecan; but above all the Masandolin or Maasudalin, as some call him. The King of Arracan also possesses part of it, even of what is on the frontiers, towards the great harbour, where lies Chatigan [Chittagong]. Of these twelve Lords nine are Mahometans, which much retards the progress of the faith." This last passage was quoted by Dr. Wise through d'Avily, *J.A S.B.*, 1875, p. 181.

Several other references to the Bhūiyās can be found in the Portuguese historians.

About 1605, Philip de Brito de Nicote tried to persuade the King of Arakan that he would make him Emperor "of the whole of Bengal, of the *Bojões*, (or twelve lords, each of them a sovereign in his own territory, and all of them united against the Mogor King and against the Mogo [Magh]), and of his other enemies." These "twelve *Bujões* of Bengala" ruled over all the low lands(?) watered by the Ganges (*eram senhores de todas terras de baixo que rega o rio Ganges*).[1]

Bishop Dom Pedro wrote from Lisbon (19 March, 1612) to the Viceroy of Goa, Dom Jeronymo de Azevedo: "In another letter of mine, sent with this packet, you will see what I write to you about the affairs of Sirião [Pegu]. After this I was informed that the Mogor sent one of his captains with a great army to Bengala and took the whole of Siripur near the [Island of] Sundiva, where he fortified himself, and the twelve *Boiões* tendered him their submission, and that he determined to march upon Chatigão [Chittagong] and pass into Arracão; and that, at the very time when the Mogor marched against Siripur, the Mogo went to Bengala with all his fleet, for the sake of attacking his neighbour, the King of Tupará [Tippera], but that he withdrew to Arracão, leaving the greater part of his fleet and artillery at Catigão [*sic*]."[2]

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[1] Cf. *Collecção d documentos ineditos* . . ., Tom. VI, 1ª Serie, *Decada 13 da Hist da India* por A. Bocarro, Lisboa, 1876, pp. 131. 440.

[2] Cf. *Ibid.*, Tom. VIII, 1ª Serie, Vol. II. Lisboa 1884, p. 226.—At

Added to this, we have the authority of Manrique, whom his sojourn of a year at Hūglī, of about 6 years at Chittagong, and his travels in Orissa (1640), to Dacca, Gaur, and Rājmahāl, had made acquainted with the whole tract over which the Bhūiyās ruled. The twelve Bhūiyās, according to him, were those of: 1. Bengala; 2. Angelim [Hijilī]; 3. Ourixa [Orissa]; 4. Jassor [Jessore]; 5. Chandecan; 6. Midinimpur [Midnapore]; 7. Catrabo [Katrabuh]; 8. Bacala [Bakla]; 9. Solimanvas [Sulaimānābad]; 10. Bulvá; 11. Dacá; 12. Rajamol [Rájmahāl]. (Cf. *Itinerario*, 1649, p. 20, col. 2.)

In another place (p. 415, col. 1, 2) Manrique writes: "The thirty-seventh Province is the very extensive one of *Bengala*, which includes in its length and breadth the twelve kingdoms which I have said, the petty kings of which the natives call the *twelve Boiones*, and I have mentioned them too. The whole tract is most fertile. The largest towns are *Daack*, or *Daca*, *Rajamol*, or *Ragmehel*. Midinimpur, Burduan, Katrabò, Cateca. Its most frequented harbours are *Vgulim* [Hūgli]. a Portuguese foundation, *Piple* in the Kingdom of Ourixa, and *Balassor* in the same Kingdom. It has other harbours; but, being less frequented, they are less known. All these lands are limited to the south by the Gangetic strait, into which by four vast mouths the Ganges discharges its voluminous, rapid and wholesome waters."

Some of the towns mentioned by Manrique are easily identified; others, such as Solimanvàs, Catrabo, and Chandecan, require some explanation.

1. *Solimanvàs.*—This must be the present district of Selīmābād, a very large pargana. "It comprises most of the land in the west central part of the district [of Bākarganj], and even extends across the Baleshwar into the Baghahāt subdivision of the Jessore district. According to Professor Blochmann, this pargana was originally called Sulaimānābād, after Sulaimān Ṣhāh of Bengal, and he suggests that the name may have been changed to Selīmābād in honour of Akbar's son, Prince Selīm, afterwards known as Prince Jahāngīr. I have, however, never seen it designated by any other name than Selimābād. It belonged to Sarkār Fathābād." Cf. H. Beveridge, *The District of Bákarganj*, pp. 118-119, 249.

"In the Introduction to a Saṁskṛt dictionary, the author gives the following genealogy of his patron: Muchhá or Murchhā Khān: son of 'Īsā Khān, son of 'Silamāna Khān." (*Note by Bābū Manmohan Chakravartī.*) From the proximity of Soli-

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p. 350, Tom. VI, 1ª Serie, Vol. I, occur the words "os Bonhas," by which the Bhūiyās of Bengal may be meant. Boccarro, *ibid.*, *Decada 13 da Hist. da India*, speaks of the Banhas or chiefs of Cosmim (Bassein), Martaban and Tavoy. The King of Martaban was Bannadelá or Banha Dalà; his son was called Banhanoy, and the name of the Captain of the Peguans at the siege of Siriam was Banhalao. Cf. Index, p. 762.

manvàs to the ancestral possessions of 'Isā Khān we might conclude that it was thus called after 'Isā Khān's father.

In the case of Solimanvàs, the ending *vás* represents the *ābād* of many Muḥammadan towns, altered by the Hindūs to a form they understood. As for Ilahābād, the reverse change took place. Cf. *J.A.S.B.*, 1904, p. 78. Thévenot and Valentyn wrote *Halabas*, and Bernier *Elabas*.

2. *Catrabo.*—This place is identified by Mr. Beveridge with Katrabuh or Katibāṛī near Sābhār, in the Mānikganj subdivision, where there is still a "tappa" called Kathorabo. Cf. *Proc. A.S.B.*, 1903, pp. 133-134. After other attempts at identification, he proposed the same solution in *J.A S.B.*, 1904, p. 62. Dr. Wise had advanced a more satisfactory solution, I believe, in *J.A.S.B.*, 1875, XLIV, p. 182. "Catrabo is Katrabo, now a 'tappa' on the Lakhya, opposite Khizrpūr, which for long was the property of the descendants of 'Isā Khān, Masnad-i-'Ālī." According to Dr. Wise, branches of the family are still settled at Katrabo. Cf. *J.A.S.B.*, 1874, p. 211. Khizrpūr is located by Dr. Wise at 9 miles from Dhākā and 3 miles W. of Sunārgāon (*ibid.*, p. 212), the latter place being, according to local tradition, equivalent to Magrāpārā. Cf. *Notes on Sunārgāon*, *J.A.S.B.*, 1874, p. 89. These conclusions of Dr. Wise are favoured by the fact that Van den Broucke's map (1658-1664, Cf. Valentyn, Vde Deel, Amsterdam 1724) locates Catrabo below and close to Sonārgāon. Fr. Francis Fernandez, S.J., visited Katrabo in 1599 from 'Siripur.' "I went also on a tour to Catrabo, which is in the lands of the Mousandolin [the Masnad-i-'Ālī was then 'Isā Khān] to see whether there would be any means of making conversions; but I found that nearly all were Mahometans. There are also there some foreign merchants, who come and go from Agra, Lahor, and other towns of the Great Mogor. . ." Cf. du Jarric, Bovrdeavs, 1614, III, p. 829, and compare with R. Finch's account of Sonārgāon in 1586: "The Chief King of all those countries was called Isacan, and he is the chief of all the other kings, and is a great friend of the Christians," many of whom, Portuguese and half-castes, were, doubtless, in his service by this time. Dr. Wise attached undue importance to Abbate Tosi's *Dell' India Orientale, Descrittione Geografica*. . Roma, 1669. Tosi never was in India. His account of Bengal is based on Manrique He may have had before him contemporary maps, but the fact that he locates Tambolim (Tamluk) on the Meghna near Loricul and Siripur goes strongly against him. Cf. *J.A.S.B.*, 1875, p. 182. Abul Fazl says that 'Isā Khān took Sonārgāon and Karābūh (some editions have Katrābūh), which was 'Isā's residence. *J.A.S.B.*, 1904, p. 58. I suggest that, with the decline of Sonārgāon, Katrābūh rose in importance, and that it was close to Sonārgāon. Mr. H. Beveridge's identification of Katrābūh with Goraboe of

Rennell's map, N. of Dacca, and a little N. of Ekdallah, on the right bank of the Lakhia or Banār (Cf. *ibid.*, p. 59) does not appear to me acceptable.

3. *Chandecan.*—The kingdom of Chandecan has been identified, correctly I believe, by Mr. H. Beveridge with Dhūmghāṭ, near the modern bāzār of Kāliganj, on the Madhumati. For the discussion of the proofs, mostly based on the early Jesuit letters (1598-1602) cf. H. Beveridge, *J.A.S.B.*, 1876, pp. 71-76, and *The District of Bákarganj*, London, Trübner, 1876, pp. 28-36, 173-180, 446, in answer to *Proc. A.S.B.*, 1868, pp. 264-273. Before 1596, when the earliest edition of van Linschoten's work was published,[1] the country to the E. of the Hūgli river was known as the country of Chandecan. One of the channels of the Hūgli near Saugor Island, if not the Hūgli itself, was then called the river of Chandecan. In 1604 the Jesuit Residence at Hūgli was designated as situated in the Chandecan district.[2] Cf. *J.A.S.B.*, 1911, p. 16. "Chandecan or Ciandecan," writes Mr. Beveridge, "is evidently the same as Chand Khan, which as we know from the life of Rājāh Pratāpāditya by Ram Ram Bosu (modernised by Hari Chandra Tarkalankar), was the name of the former proprietor of the estate in the Sunderbans which Pratāpāditya's father Bikrāmaditya got from King Daoud. Chand Khan Masandari[3] had died, we are told, without leaving any heirs and consequently his territory, which was near the sea, had relapsed into jungle. Bikrāmaditya saw that King Daoud would be ruined, as he had taken upon himself to resist the Emperor of Delhi, and therefore Bikrāmaditya, who was his minister, took the precaution of establishing a retreat for him-

[1] Cf. van Linschoten's *Le Grand Routier de Mer*, Amsterdam, 1638, already published as Pt. II of his *Itinerario ofte Schipvaert*, Amsterdam, 1596, Ch. XI. *Navigation & cours des Indes a Porte Piqueno de S. Iago a l'entrée du fleuve Ganges au Royaume de Bengala.* It is to be regretted that Burnell and Tiele did not republish it in the Hakluyt edn. of van Linschoten's work.

[2] I must correct here a mistake which I made in *List of Portuguese Jesuits in Bengal*, *J.A.S.B.*, 1911, p. 25. It is not true that the Jesuit "College of Bengal" is described in the Catalogue of 1664 as "the Residence of Chandecan." Fr. H. Josson, S.J., who has had access to the old Jesuit Catalogues of Goa and Malabar shows how the mistake was made. "The Catalogues of Goa and Malabar are bound together till 1608, and your extract for 1604 (*J.A.S.B.*, 1911, p. 16) is there. Afterwards the Malabar Catalogues are bound separately. There is to be found, in its proper chronological order, a Catalogue for 1664. What struck me was that it looked so much like the one for 1604 in the other volume. Even the names of the four Fathers were those of 1604. The words "in the College of Bengal" are not there; but, I saw "in Bengalla," as at your p. 16. I examined therefore the date written at the beginning. It was 1064, but with a strange addition, a flourish above the *o*, which gave the look of 1664 to a mistake of the copyist!" (*Letter from Brussels, 14 Aug. 1913*).

[3] Masnad-i-'Ālī.

self in the jungles. King Daoud was killed in 1576, and Bikrāmaditya, though he had prepared a city beforehand, seems to have gone to it in person about this time. His dynasty had been only about twenty-four or twenty-five years in the country when the Jesuits visited it (1598), and it would have been quite natural if the name of the old proprietor (Chand Khan) had still clung to it. Moreover, we know that Pratāpāditya did not live always, at least, at his father's city of Jessore. He rebelled against him, and established a rival city at Dhūmghāṭ. In so doing he may have selected the site of Chand Khan's capital, and this may have retained the name of Chand Khan for two or three years after Prātāpaditya had removed to it.." Cf. *The District of Bákarganj*, p. 176. Mr. H. Beveridge works out in the sequel the identity of Dhūmghāṭ with Chandecan from its proximity to Jessore.

Fr. Francis Fernandez wrote from Siripur near Chittagong on January 17, 1599: "Certainly this country of Chandecan promises us a large harvest: for it is so large that it takes generally 15, nay 20 days by boat before one gets to its limits. In the forests and woody tracts they collect a great quantity of wax, which is carried by merchants from there throughout Bengal and through the whole of India; and, since the settlement of Chandecan is midway between Porto Grande [Chittagong] and Porto Pequeño [from the Jesuit lettters of that time, it must have been Kulpi or near it], it is easy to navigate from there to all the parts of Bengal."

I find in the Portuguese historians references to the King of Chandekan as late as 1613. From a letter of the King of Spain (Lisbon, 20 Febr. 1610) to the Viceroy of Goa, Ruy Lourenço de Tavora, we learn that Philip de Brito de Nicote had represented to the King that it was easy to seize the treasures of the King of Chandecão. He was a tyrant, one of the powerful chiefs of India, "and subject, not to Arracão, but to the King of Guouro" [Gaur]. Seizing his lands would put an end to "Akbar's" pretensions over the whole of Bengal.[1] It was not advisable either that the treasures of the King of Chandecão, a man *de pouco poder e de gente pusillanime*, should be let fall into Akbar's hands.[2]

In a letter of Bishop Dom Pedro to Dom Jeronymo de Azevedo, Viceroy of Goa (Lisbon, 15 March 1613), there is question of the Mogorese having taken the Porto Grande, Siripur, and Chandecão (*o Chandecão*).[3]

Mr. Beveridge could find no mention of Chandecan in the old maps. I find it referred to as "Ile de Chandecan" in a

[1] Akbar had died in 1605.

[2] Cf *Collecção de documentos ineditos*, Tom. VII, 1ª Serie, Tom. I. Lisbon, 1880, p. 354.

[3] Cf. *ibid.*, Tom. VIII, 1ª Serie, Tom. II, Lisbon, 1884, p. 392.

map of Sir Thomas Roe (1632) reprinted by the *Scottish Geographical Magazine*, 1902. A copy of it can be seen along the staircase of the Imperial Library, Calcutta. Again, it is to be traced in the earlier editions of van Linschoten, where Angelim [Hijilī] is placed in the Island of Chandecan. Father A. Monserrate's map (*ante* 1600) mentions also Chandecan. He places it on the coast, at the mouth of one of the outlets of the Ganges; but, as he did not visit Bengal, his authority in this matter amounts to little. Bernouilli was, probably, not far wrong when he stated that the Province of Sātgaon was anciently called Kandecan.[1]

The Bhūiyās proposed by Dr. Wise for the period 1576-93 are:—

1. Fazl Ghāzī of Bhowāl.
2. Chand Rāī and Kedar Rāī of Bikrampūr (Srīpūr).
3. Lak'han Mānik of Bhaluah.
4. Kandarpa Nārāyaṇa Rāī of Chandradwīp.
5. 'Īsā Khān, Masnad-i-'Alī, of Khizrpur.
6. Rājā Pratāpaditya of Jessore.
7. Perhaps, Mukund Rāī of Bosnah. (*J.A.S.B.*, 1874, p. 199.)

Blochmann speaks of the Bhūiyās of Bhaluah, Bakla, Chandradip, Faridpur, the 24-Parganahs and 'Īsā Khān, mentioned in the Akbarnāmah as the chief of the Twelve Bhūiyās. (*J.A.S.B.*, 1895, p. 305).

These lists do not agree. Taking the Jesuit list of 1599 as our standard, we find that the Masandolin of the Jesuits was 'Īsā Khān, Masnad-i-'Ālī, whose seat was at Katrabuh, rather than at Khizrpur, as shown by Mr. H. Beveridge, *J.A S.B.*, 1904, p. 58. The Bhūiyā of *Bacala* (Bakla) corresponds (?) to Dr. Wise's No. 4; the Bhūiyā of *Siripur* to Dr. Wise's No. 2: the Bhūiyā of *Chandecan* is Manrique's No 5 and Blochmann's Bhūiyā of the 24-Parganas, (with Jessore excluded, according to Manrique). The Bhūiyā of *Solimanvàs* (Manrique's No. 5), a Muḥammadan, as we should expect, tallies with Blochmann's Bhūiyā of Faridpur.

Even after striking out the Bhūiyā of Bosnah in Dr. Wise's list, we see that his list, which refers to a period only slightly earlier than that of the Jesuits, contains more than three Hindū Bhūiyās, *i.e.*, Nos. 2, 3, 4, 6.[2] True, we are in

[1] Cf. *Descr. Histor. et Géogr. de l'Inde*, Vol. II, Pt. I, p. 408.
For notes on Pratāpāditya's life cf. H. RAINEY, *Jessore*, in *Sel. from the Calcutta Review*, IV (Febr.-May 1895), pp. 76-78, or *Calcutta Review*, LXIII, July 1876, pp. 14–16; REV. J. LONG, *The Chronicle of Krishnagur*, in *Sel. from the Calcutta Review*, VI (Febr.-May 1883), pp. 267-287, or *Calcutta Review*, XXV (July 1885), pp. 104-116; and chiefly J. WESTLAND'S *Report on the district of Jessore*, Calcutta, 1874.

[2] In 1663 the son of the Rājā of "Busna," a Hindū, became a Christian, while in captivity at Chittagong, and took the name of Don

the same case with regard to Manrique's catalogue, the Bhūiyās of Chandekan, Jassor, Bacala, and Bulvà suggesting Hindū Zamīndārs, and it does not follow that Manrique or Dr. Wise is wrong for the period each refers to.

Dr. Wise's list has the disadvantage of relegating to a small portion of Eastern Bengal a preponderating number of the Bhūyiās, and of not accounting for the rest. Manrique's enumeration takes in the whole of Bengal. Dr. Wise objected to it because Orissa, "Jagannāth," and Midinīpūr could not have had separate rulers, and the name of Bengala seemed to recall the fabulous city on which so much was written by the travellers of the XVIth and XVIIth centuries. (*J.A.S.B.*, 1875, p. 182.) These objections must be overruled.

1. Dr. Wise did not notice the fact that Jagannāth was corrected to Jassor among Manrique's errata.

2. The term Bengala, as applied to a town, can never have created any difficulty to the travellers visiting Bengal in the XVIth and XVIIth centuries. Unfortunately, so little attention has been paid to the accounts of Bengal written by the earliest European travellers in Bengal, especially the Portuguese, that the passages in which the name of Bengala is found, as applied to a town, have never been properly collated. The general impression produced on me by my reading is that the term has been used for a variety of places: Sonārgāon, Sātgaon, Chittagong, and even such places as Hūglī and Chandernagar; that, in fact, it applied to the chief port at the time. It is easy to understand why "Bengala" should have been placed at Chittagong by Portuguese cartographers. The first Portuguese settlement was at Chittagong from about 1534, and, till the time when they founded Hūgli (1578), "to go to Bengal" must have meant for the Portuguese "to go to Chittagong." *Bengala* once located at Chittagong by the Portuguese geographers, the mistake continued to be reproduced in the old maps even as late as 1743. (YULE, *Hobson-Jobson*, s.v. Bengal). Lubinus, an Augustinian writer, seeing the Hūgli convent of his Order described in 1634 as the Convent of Bengala, placed it at Chittagong, on the Cosmi (Bassein) river, too. We have letters from Chandernagar dated "*A Bengale*," where, however, "*Au Bengale*" might be the meaning. The old English expression for "*in Bengal*" was often "*at Bengal*." The difficulty for us now is to know to what particular city the travellers of a particular period applied the term. But, this is no reason why we should get impatient and speak of Bengala as a mythical city, or fancy that it was somewhere in the Sundarbans and has long since been swept

Antonio do Rozario. Set free, he prevailed on many of his ryats to become Christians. The descendants of these Christians are now mostly what we call our "Dacca cooks."

away by a tidal wave. This theory, lately revived by one of our University lecturers, has no chance of finding favour.[1]

Since the twelve Bhūiyās are invariably represented as vassals of a King Emperor, we should understand that the King was not himself one of the Twelve. This conclusion is borne out by the practice still in vogue in Arakan in 1631. (Cf. *infra*). We saw above (p. 442) that the Bhūiyās are spoken of in 1610 as subject to the King of Gaur. Manrique says that the Monarch of *Bengala* "who resided formerly at Gaur" (cf. p. 20, col. 2) had under him "twelve petty Kings in the twelve Provinces under him." The Bhūiyā of Manrique's *Bengala* must then have been governor, not of a mythical city, but of the district where the King or Emperor had his capital at the time being.

Now, since the twelve Bhūiyās depended in 1640 from the Moghul Emperor, and Gaur was reduced to a heap of ruins, while Sātgaon had declined; since again the chief cities, such as Rājmahāl and Dacca, are accounted for as having had a Bhūiyā, the difficulty is where to place the residence of the Bhūiyā of Bengala. The mention in 1632 of "Minimican, son of Massacan, who had been Emperor of Bengal before the Moors conquered it," which I find in an unpublished letter of Fr. John Cabral, S.J., November 12, 1633, serves only to puzzle us further; for, as pointed out to me by Bābū Manmohan Chakravartī, Massacan represents Muchhā Khan, son of 'Īsā Khan, who had had his capital either at Sonargaon, or Katrābūh in the neighbourhood. I suggest then that the Bhūiyā of Bengala in Manrique's time governed the district of Tāndā.

[1] This is not the place to discuss the question at any length. Though I differ with Sir Henry Yule from G. P. Badger's conclusions, I refer the curious to his *Travels of Ludovico di Varthema*, Hakluyt edn., London, 1863 (cf. index, *s.v.* Banghella), and to Sir H. Yule's *Cathay*, II. 465, p. 1.

Here is an example of the endless trouble to which we are put by the compilations of early European geographers. Peter Heyleyn in his *Cosmographie, in Four Bookes, containing the Chronographie and Historie of the whole World, and all the principall Kingdomes, Provinces, Seas and Isles thereof*, London, 1652, mentions the following towns in Bengal: Bengala, Gouro, Catigan [Sātgaon, or possibly Chittagong], Taxda [Tanda], Porto Grande [Chittagong], and Porto Pequeno [Hūgli]. Bengala is thus described: it "gave name to the whole Kingdom, situate on a branch of the River *Ganges*, and reckoned for one of the most beautiful towns of all the *Indies*. Exceedingly enriched by trade, but more by *Pilgrimages*, by reason of the holyness and divine operations ascribed by the *Indians* to the waters of it: there being few years in which not visited by three or four thousand Pilgrims." (Cf. *Bengal Past and Present*, Vol. II, p. 53). Now, this part of Heyleyn's compilation is based on Purchas' *Description of India*, Ch. II. (Cf. J. Talboys Wheeler's *Early Travels in India*, Calcutta, 1864. p. 5.) But, whereas Purchas speaks of Ganga Sāgar, to which 4000 pilgrims often resorted from Cambay alone, and where as many as three or four hundred thousand pilgrims congregated at times, Heyleyn calls the place Bengala, perhaps because there is question in Purchas of a Governor of Bengala who gave these particulars.

It had become the capital of Bengal after Gaur, and was a favourite residence of the Moghul Governors of Bengal until the middle of the XVIIth century.

3. There is no difficulty to admit that the Bhūiyā of Orissa had his capital at Cuttack. In Bruton's time (1632) the Nawāb of Orissa lived at Cuttack.

4. Between 1628 and 1640 there was a Bhūiyā at Hijilī, whom Manrique styles the Masandolim, under which, we recognize again the sonorous title of Masnad-i-'Ālī. In 1697 the Governor of Hūglī was appointed to Hijilī. Cf. C. R. WILSON, *Old Fort William in Bengal*, I, 22.

5. The trouble which Manrique must have taken to get at the names of the Twelve Bhūiyās and his researches among the revenue papers of Rājmahāl, Multān and Kandahār (p. 409, col. 2) are a guarantee of his correctness about the Bhūiyā of Midnapore.

6. Dr. Wise's objections to Manrique's list appear to rest on the supposition that Bhāti, the country where the Bārah Bhūiyās ruled, was "the lowland subject to the influx of the tide." Cf. BLOCHMANN, *Contributions to the Geogr. and Hist. of Bengal*, p. 18. Col. Jarrett described it similarly as "the coast-strip of the Sunderbuns from Hijlī to the Meghna." Cf. *Āīn*, II, 116, *n.* 3. Indeed, Abul Faẓl has puzzled all his commentators by describing Bhātī thus: "Bhātī is a low-lying country, and is called by that Hindī name, because it lies lower than Bengal. It extends nearly 400 *kos* from east to west, and nearly 300 from south to north. On the east lies the sea and the country of Jessore; on the west lies the hill country south of Tānda; on the north the salt sea, and the extremities of the hills of Tibet." Cf. ELLIOTT, *Hist. of India*, VI. 72–73, and H. BEVERIDGE, *J.A.S.B.*, 1904, p. 58.

Mr. H Beveridge makes some very plausible suggestions. "The unintelligible southern boundary for the country of Bhātī given by Abul Faẓl, *viz.*, "South Tānda," may be a mistake for Lānda which in the *Riyāẓu-s-Salaṭīn* is given as one of the boundaries of Orissa. I do not, however, know what place is meant by the author of the *Riyāẓ*. The passage occurs at p. 15, line 10 of his work, and the full boundary is Lānda Dalūl..... According to Abul Faẓl's description, it [Bhātī] was a very large tract of country, and its breadth from N.E.S. was 300 kos, or more than Bengal, whose breadth from N.E.S. was only 200 kos. Apparently, it included the whole of East Bengal, together with much of Sylhet. The eastern boundary of Bhātī is given by Abul Faẓl as Ḥabsha, or as Jasur (the MSS. do not agree), and Professor Dowson has rendered this as Jessore (ELLIOTT, VI. 73). But Abul Faẓl calls the boundary a *Wilāyat* or country, and Jessore was not even a Sarkar in his time, but only an alternative name for a pargana. I therefore believe that the boundary meant is

Jaintia which in the *Āīn* is spelt Jesā (JARRETT, II, 139). Perhaps, this may help to explain Abul Faẓl's impossible northern boundary, *viz.*, *yā dāryā-i-shor*, the ocean. Perhaps what he meant, or his informants meant, was *daryā-i-sūrma*, *i.e.* the river Soorma." (*J.A.S B.*, 1904, pp. 62–63.)

We might ask our philologists whether any other meaning could be found for the word Bhātī than that proposed by Abul Faẓl, "a low-lying country, *because it lies lower than Bengal* (?)," or the one proposed by Dowson: "Bhātī = down the stream." (ELLIOTT, VI, 72.) What moved Wilford, a good linguist, to speak of "the twelve Bhūiyās, or *Bhattis* or *principalities* of Bengal"? Cf. *supra*.

The dignity of the Bārah Bhūiyās appears to have had its roots in a very ancient institution, the origin of which we must leave to others to investigate. The following points deserve attention:—

"It is not clear," writes E. A. Gait (*A History of Assam*, 1906, p. 37), "why the number *twelve* should always be associated with them, both in Bengal and Assam. Whenever they are enumerated, twelve persons are always mentioned, but the actual names vary, just as in the case of the Muhammadan *Pānch Pīr* different saints are counted by different people. It seems to have been the practice in this part of India for Kings to appoint twelve advisers or governors. Nar Nārāyan had twelve ministers of state; twelve chiefs or *dolois* administered the hilly portions of the Rājā of Jaintia's dominions, and there were twelve State Councillors in Nepal."

Manrique assisted in January 1631 (?) at the enthronement of the Emperor of Arakan, Xadamxa II [Tiri Thudamma Rājā?]. He describes the ceremonies at great length, and takes occasion to remark that the new dignitary had himself proclaimed, not only Lord of the twelve Boiones [Bhūiyās] of Bengala, but of the twelve Kings on the crown of whose heads the soles of his feet always rested. (Cf. *Itinerario*. p. 206, col. 2.) Before the ceremony, twelve Lords of Arakan were crowned Kings (pp. 204, col. 1; 212), and eight days were spent in festivities after the coronation of each. On the day of the Emperor's coronation, these twelve vassal kings walked before him in procession and stood around his throne (p. 215, col. 2).[1]

[1] Horrible to relate! The "Emperor" of Arakan fearing to be overtaken by death within one or two years after his coronation, resolved at the suggestion of a Muhammadan doctor, who had twice gone to Mecca, to avert the decrees of Fate by a sacrifice consisting of 6000 human hearts, 4000 hearts of white cows, and 2000 hearts of white pigeons. Troops were sent to seize all those who could be found in the streets and fields till the fatal number was completed. The hearts collected during the day were carried at night to a deep hollow between two lofty mountains where the sacrifice was performed. Emissaries were sent to the neigh-

Hugh Murray has summarised for us from Manrique the chief proceedings of the investiture of the Twelve Bhūiyās of Arakan.

"Six months were employed without intermission throughout the kingdom in making preparations, and in particular a copious supply was brought of the holy waters of Sagur. As the time approached, such crowds came from all the kingdoms, states, and cities of Indostan, Ava, Siam, Sumatra, and other various islands and countries, that Arracan became, as it were, an epitome of the East. The ceremony began with the coronation of twelve kings, who were each to reign over one of the provinces subject to Arracan. On this occasion, the emperor being seated on a splendid throne, with all his lords in attendance, the king was introduced, who, on approaching the throne, began a series of bows and prostrations, which ended with his laying himself flat on the ground, to which he rivetted his lips. In this posture he remained till four lords came and lifted him up. On approaching a little nearer, he repeated the same series of prostrations, and so on for five times; but on being raised the fifth time, he found himself close to the imperial throne. A golden idol, three feet high, with a garland of flowers on its head, was then brought forth. The king took it in his hand, and after six prostrations, placed it on his head, then pronounced a solemn oath of allegiance to the emperor. That prince then declaring the king to be worthy that part of the imperial feet should rest on his head, placed on him the crown. The great trumpet was then thrice blown, and the whole assembly fell prostrate on the ground, upon which a curtain being drawn, hid the emperor from the view of the assembly. Eight days elapsed between the coronation of each king: which period was spent by the one last crowned in magnificent processions by land and water, and in keeping open table for all the citizens." (Cf. *Histor. Account of Discoveries and Travels in Asia*, Edinburgh, 1820, II. 110-111.)

In 1599, the King of Pegu claimed as his vassals the twelve sub-kings of 1. Cavelan, 2. Ava, 3. Bacan, 4. Tungran, 5. Prom, 6. Iangoma, 7. Lauran, 8. 9. Truco, 10. 11. Cablan, 12. Siam. Cf. DU JARRIC, *Histoire*. ..., I. 616. And since the King of Arakan was on several occasions master of Pegu, we

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bouring towns where the inhabitants were less on their guard. The cries of the people at length rose to such a pitch that an insurrection was imminent, had it not been announced that the sacrifice prepared "for the impious altars of hell" was now complete, and that the coronation would take place within 6 months. Blissful times, forsooth, when those who ruled India's destinies could not build a bridge or lay the foundations of a new fortress, without a hecatomb of human victims. We can read nothing more savage in the history of Mexico under the Aztecs Cf. MANRIQUE, *Itinerario*, ch. 31, or H. MURRAY, *Histor. Account of Discoveries and Travels in Asia*, Edinburgh, 1820, Vol. II, pp. 109-111.

may suppose that these twelve sub-kings were also among those "on the crowns of whose heads the soles of his feet always rested."

Again, Father Monserrate (1581-82) speaks of Rānā Partāb Singh of Udaipūr, "cui duodecim reguli parebant." May we not also compare with this a sentence in Friar Jordanus' *Mirabilia descripta*: "In this Greater India are *twelve* idolatrous Kings, and more"? Cf. YULE, *The Wonders of the East*, Hakluyt edn., 1863, p. 39.

"In Malabar," writes Ibn Batuta, "there are twelve idolatrous Sultans, among whom some are powerful, with armies amounting to fifty thousand men; some weak, their army consisting only of three thousand men." Cf. C. DEFRÉMERY and B. R. SANGUINETTI, *Voyages d' Ibn Batuta*, Paris, 1858, IV, 75.[1]

This sacredness of the number *twelve* in India cannot be considered fortuitous. It may fitly be compared with other instances in other parts of the East. At any rate, the important conclusion appears to be reached that an institution so firmly fixed and widely spread in India must go back to very remote times. The Bārah Bhūiyās of Bengal existed very probably under the Hindū Rājās of Gaur. In view also of the fact that the dignity still flourished in Arakan in 1631, we do not think that the number *twelve* was merely conventional, or that in the minds of the people all dignitaries next to a Rājā belonged to the Council of Twelve. (YULE, *Op. cit.*, p. 39 *n.* 2; GAIT, *Op. cit* , p. 37.) Yet, if the title was not hereditary, but bestowed at will by a suzerain on the occasion of his accession to the throne, it might have followed that, though it belonged strictly to only twelve dignitaries in each reign, a larger number laid claim to it, or were designated by it among the lower ranks. Those thus designated by a previous ruler might have continued to call themselves or be called Bhūiyās. This may explain the gradual degradation of the term. The term Bhūiyā has now fallen from its high estate in Eastern Bengal, and has become a common appellative. (*J.A.S.B.*, 1874, p. 198.) The same has happened to the term Rājā in its forms *Roy* and *Rāo*.

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[1] Even at the risk of extending too far the sway of the sacred number twelve I must note that Mandelslo (*Travels in the East Indies*. London, 1669) writes under the year 1639: "In every village [of the Island of Formosa] there is a kind of Senate, consisting of twelve persons, which are changed every two years." The passage from which I extract this quotation is merely a translation of Zegert de Rechteren's observations in 1632. Cf. *Beghin ende voortgangh der Vereenighde Nederlantsche Geoctroyeerde Oost-Indische Compagnie*, II Deel, 1646, p. 49 (*read*: 61).

48. The Pitt Diamond and the Eyes of Jaggannāth, Purī.

A further note by the Rev. H. Hosten, S.J.

Qui cherche, trouve, though very often we make our discoveries long after we have given up the search, and while we are looking for something else.

Here is another reference to the rubies in the eyes of Jagannāth.[1]

"On Thursday, the 4th of August [1701], we passed pretty close to the famous Pagode Jam-grenats, the Statue of which is, they say, of massive gold, & as big as the Saint Christopher of Nôtre-Dame of Paris. The two eyes of that Idol are two big rubies of inestimable brilliancy & value. The architecture of the Temple, though grotesque in taste, is charming in its regularity & beauty. It is said that this Pagode is served by 1400 Brahmans [*Brâmes*], or Priests of the Idolaters of that country."[2]

This passage strengthens considerably our conclusion that the Pitt Diamond did not come from Purī. About December 1701 Jaurchund offered Pitt the famous diamond;[3] Pitt bought it at Madras about February 1702 and sent it home on October 9 of that year. Already in a letter from Madras dated October 18, 1701, he had written to Sir Stephen Evance, his London agent, that he had heard of two or three large stones up the country, and his letter clearly suggests that Sir Stephen had put him on the search of a particular big stone.

On the other hand, here is Biron, a French surgeon, who in August 1701 hears of two *rubies* in the eyes of Jagannāth, but nothing about any theft. It was later, then, after Pitt's transaction, that the legend sprang up connecting his diamond with a theft from the temple of Jagannāth. A charge of dishonesty was first made against Pitt during the short time that Addison was Governor (September 18–October 19, 1709). Even then there was no mention yet of Purī.[4]

"*A massive statue of gold, as large as St. Christopher.*" This expression of Biron's is worth comparing with Friar Odorico de Pordenone's description of a wonderful idol (*c.* 1321),

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[1] Cf. our previous notes in *J.A.S.B.*, 1912, pp. 133-144: 1913, No. 5.

[2] Cf. C. Biron, *Curiositez de la Nature et de l'Art, aportées dans deux Voyages des Indes: l'un aux Indes d' Occident en 1698. & 1699. & l'autre aux Indes d'Orient en 1701. & 1702.* Paris MDCCIII, pp. 55-56.

[3] Cf. Yule, *Diary of W. Hedges*, III, pp. cxxv, cxxvi, cxxxvii.

[4] Cf. *Ibid.*, pp. cxxi, cxxii.

which all the provinces of India greatly revered. Neither Sir Henry Yule nor H. Cordier gives us his opinion as to where this idol was worshipped. But, there can hardly be any doubt that the temple of Jagannāth is intended. Yule goes so far as to say: "One might think Odoric had got to Juggernath." (Cf. *Cathay and the Way Thither*, I. 83, *n.* 2.) I note, however, that Yule refers the passage to the South of the Peninsula in *Hobson-Jobson*, s.v. Juggurnath. Odoric may very well have heard the story of Jagannāth at Quilon, from the mouth of some of the St. Thomas' Christians, or from European travellers, or Arabian sailors, and the expression "as big as St. Christopher" may be his own entirely, his native informers merely using some such word as "giant-like", an epithet which might have applied to the statues of the *Rākshasas* at the entrance to the temple. The expression recurs in Odoric in connection with the idols of a monastery at Zaitun in China. (Cf. Yule, *Cathay*, I, 109.)

"The idol," says Odoric, "is as big as St. Christopher is commonly represented by the painters, and it is entirely of gold, seated on a great throne, which is also of gold. And round its neck it hath a collar of gems of immense value. And the church of this idol is also of pure gold, roof (and walls) and pavement." Cf. Yule, *Cathay*, I, p. 81. Now, though it is quite true that this description does not tally at all with what we know of Purī, Odoric in this and in the remainder of his account would not blunder more than several other travellers, less remote from our own days, who had had the advantage of coming closer to Purī. The point to be remembered is that in the text we quoted from Tavernier (Cf. J.A.S.B., 1912, p. 137, *n.* 2) there is question of precious stones hanging about the idol's neck, a detail to which we found the counterpart in Faria y Souza in connection with an idol near Calicut. It is a far cry from Tavernier or Biron to Odoric de Pordenone, no doubt; but, legends once started are hard to kill. While leaving much freedom to the inventiveness of individual narrators, they often betray much fixity in small details. A good example is the legend of St. Thomas and the tree which came floating from Ceylon to Mailapur. Shall we say that Biron's mention of St. Christopher is merely fortuitous? Is it a reminiscence from Odoric? Biron quotes Marco Polo, but does not refer to Odoric. Is it not rather tradition reasserting itself about 400 years later? Biron's informers had not seen the idol of Purī, neither had, we may suppose from their description, those who described it to Odoric. Yet, in both cases, it is compared to the giant St. Christopher, who according to the *Légende dorée de Voragine* (Paris edn. 1843, I, p. 179) was "terrible in appearance, and twelve cubits high."

I must quote still another allusion to diamonds in Jagannāth's eyes. I take it from "*An account of the Countries*,

Cities and Towns, adjacent to Bengal, contained in Mr. Plaisted's Map, by a Gentleman who resided there many years."[1]

"At *Jagranaut*, there is a Pagod of another kind, which is resorted to by Pilgrims from all parts of *India*. It stands in a Plain about a Mile from the Sea, and is built of Stone in the shape of a *Canary* Pipe set on the end. It has no Windows, but is illuminated with Hundreds of Wax Tapers, which burn Day and Night. The Idol is an irregular Figure of Black Stone, *with two rich Diamonds placed near the Top to represent Eyes*, and the Nose and Mouth are not carved but painted with a red Colour...."

Our researches have reached a stage where we may confidently deny all connection between Pitt's diamond and the idol of Jagannāth. The following chronological summary, while making this clear, will show that the Jagannāth legend should now be tracked in another direction. "The variants of the Jagannāth legend in the ancient Historians and Travellers" would form a fruitful theme for sagacity and critical acumen; but, we do not feel specially tempted just now to bring the texts together.

Summary of the Question.

Pitt's allusion to the diamond in his letter (Madras, October 18, 1701) to Sir Stephen Evance, London, supposes an earlier allusion from his correspondent. The diamond was offered to Pitt at Madras in December 1701, bought by him in February (?) 1702, and sent home on October 9, 1702. On August 3, 1709, Pitt was charged before his Council at Madras with having bought a diamond to the Company's prejudice. He was not, however, accused of having stolen it. The Company probably apprehended trouble from the Great Moghul, before whom Lieut. Seaton appears to have charged Pitt of having bought "great diamonds." In fact, the Great Moghul claimed the diamond in 1710, not knowing, it would seem, that it had left the country long ago. Pitt's emphatic declaration (Bergen, July 29, 1710) of how he obtained the diamond from the jeweller Jarchand leaves us in the dark about its provenance; but, Hamilton's account (*ante* 1728) obtained from Glover, who had introduced Jarchand to Pitt, points to the Golkonda mines. So does the account of Salmon (1752), who absolves Pitt from all manner of compulsion. The diamond had been sold to France in 1717.

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[1] The volume is Bartholomew Plaisted's *A Journal from Calcutta in Bengal..... to England in the year MDCCL.* 2nd Edn., London, 1757. Our Calcutta libraries appear not to possess any copy of this work. The date of the extract seems to be 1750. Compare: "The East India Company had formerly a fine Factory here [at Cuttack], some of the Walls of which were standing about [the year 17?] 50." Cf. *Bengal Past and Present*, Vols. III & IV, pp. 602-603, through which I quote.

We have traced the legend of previous stones in the eyes of Jagannāth in the following authors :—

1. Friar Odoric de Pordenone (*c.* 1321) may be understood as describing the idol of Jagannāth. It had a collar of gems about its neck, and was as great as St. Christopher.

2. Tavernier, who was at Huglī in 1666, writes that the idol had two diamond eyes, and a diamond hanging from its neck. A jeweller, who was making off with them, was struck down on the threshold by the irate god.

3. The *Tabçirat-ul-Nāzirīn*, referring to facts which occurred between 1690 and 1713, states that the eyes of the idol consisted of two jewels, and that the statue was sent to Aurangzib at Bijāpur, where it was broken on the steps of the mosque. We have given our reasons for considering this story as apocryphal.

4. The ubiquitous Manucci, writing between 1699 and 1701, relates how two Portuguese, brothers, dressed up as *jogīs*, were allowed to live in the temple and ran away with its diamonds.

5. On August 4, 1701, C. Biron passing near Purī, heard of two rubies in the eyes of the idol, which was as big as St. Christopher. Note the proximity of this date to October 18, 1701, when Pitt wrote to Sir Stephen Evance about the stone which he acquired so soon after.

6. Fr. G. Tachard, S.J., in a letter from Chandernagar (January 18, 1711) speaks of a Frenchman who, disguised as a *jogī*, introduced himself into the temple and stole a ruby from one of the idol's eyes. The story had happened about 30 years before!

7. Fr. Bouchet, S.J., writing from Pondicherry (April 19, 1719) reproduces part of Tavernier's description of the idol, and suggests that the other things he relates (the theft of a ruby, and the sudden death of the thief ?) are suspicious.

8. Plaisted's description (Bengal, 1750) mentions two diamonds in the eyes of the idol, but alludes to no robbery.

9. An anonymous Jesuit, newly arrived at Chandernagar, writes on January 1, 1753, that an Englisnman had "some years ago" plucked out one of the two precious stones in the idol's eyes, and the rumour was that he had sold it to the King of France. This is the first Jagannāth story in which Pitt is aimed at. Coming so many years after Pitt's purchase of the diamond, it ought to have found even less credence than the story of the slave, who hiding the stone in a gash in his thigh, brought it from the mines of Parkat to Madras.

10. Anquetil du Perron, passing through Purī on June 6, 1757, was told that the idol's eyes consisted of a ruby and a carbuncle and that a Dutchman had stolen the ruby.

We have also compared with these stories four earlier ones hailing from other places.

According to Alberūnī, an idol at Multān had two precious stones in its eyes.

The Jesuits relate in 1604 that the idol of Mahesse (Maheswar ?) of Diu had had its eyes (consisting, probably, of precious stones) gouged out by a Portuguese soldier.

Finally, Faria y Sousa describes an idol seized at Calicut by the Portuguese in 1502, which had two emeralds in its eyes and a large ruby on its breast. Another idol at Cranganor had three rubies on its forehead. The two passages in Faria y Sousa bear some resemblance to Tavernier's description of the Jagannāth idol.

A REPORT ON THE BIOLOGY OF THE LAKE OF TIBERIAS.

Third Series.

List of Subjects dealt with in Third Series.

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The first series of papers in this Report was published in Vol. IX, No. 1, of this Journal, pp. 17–88 (1913); the second series in the same Volume, No. 6, pp. 111–258 (1913).

49. The Planarians of the Lake of Tiberias.

By R. H. Whitehouse, M.Sc., *Queen's University, Belfast.*

Communicated by Dr. N. Annandale.

(Plate XXVI).

The whole collection included over 50 specimens, 10 of which belong to one species, about 40 to another and the remainder to a third; thus three species are represented, all of which, so far as it is possible to determine, are new. One of them, *Planaria tiberiensis*, was obtained in three localities, viz. from "a small brackish spring running into the lake near Mejdal"; from "a spring running into the lake at Mejdal"; and from "a pool near Ain-et-Tineh, under stones." The second species (*Planaria salina*) was obtained from "the lower surface of stones in saline water near et-Tabghah"; while the third (*Planaria barroisi*) was taken from the edge of the Lake at Tiberias.

For systematic work on Triclads there is no more important system than the reproductive; in fact it is essential. It is well known that many planarians are sexual individuals at certain times of the year only, and that during the rest of the year they lack sexual organs and reproduce by fission. Thus when only non-sexual individuals are available, their identification must always remain uncertain, and the matter cannot be finally settled until periodic observations can be made.

All of the animals in this collection were non-sexual, and thus their identification is at present only provisional; but it is hoped that the descriptions and figures given will be a useful foundation for any future periodic work that may be attempted at the Lake of Tiberias.

Planaria tiberiensis, n. sp. (Pl. xxvi, figs. 1 to 4.)

This species was collected in three localities, two near Mejdal and one near Ain-et-Tineh. The only difference between the animals from these collections was that the majority taken from the spring at Mejdal were smaller than in the other collections, which merely indicated that most of them were younger specimens.

The average length of the animals from the brackish spring was $5\frac{1}{2}$ mm. and their breadth at the widest part of the trunk 1·3 mm.; they are thus comparatively small animals even when apparently full grown. The specimens from the spring

running into the lake at Magdala were much smaller and measured slightly under 3 mm. in length and barely half a millimetre in breadth. However one specimen measured 5·7 mm. and another 4 mm., while one attained a length of only 2·4 mm.

Dorsally, the colour in spirit is a dull and rather dark brown, and evenly distributed; the ventral surface is somewhat paler in colour than the dorsal, though the difference is not very marked; in fact in many cases the colour was similar on both sides.[1]

The head has a pronounced lappet on each side, which feature gives the head a definitely triangular shape with a blunt anterior end; as a result of the lappets a well-marked neck region is present. In the collection taken from the spring at Mejdal the form of the head in most cases was semicircular (see fig. 3); in the larger animals of the same collection however, the shape of the head was similar to that of the specimens from the brackish spring in the vicinity; therefore the rounded shape of the head seems to be a character of the younger animals and no ground for specific separation.

The eyes are situated well back, and are separated by a space somewhat less than the distance from each eye to the side of the head; they are reniform and not surrounded by an area devoid of pigment.

Careful search has been made to detect the presence of auricular sense organs (lateral sensory grooves) on the side of the head, but they could not be detected with certainty on the whole animal. Serial sections however revealed these structures in the form of a dorso-lateral patch in which the epidermal cells were devoid of rhabdites and provided with cilia; beneath was a nervous mass which was supplied by a nerve direct from the brain. This auricular sensory area was about 0·1 mm. in diameter and roughly circular. Though these organs could not be seen with much certainty in the entire animal, at any rate in every specimen, some animals after the closest scrutiny were suspected of possessing a circular differentiation just beyond the lappets of the head at the beginning of the neck; the sections show clearly that this suspicion was correct, and I have indicated the position in figs. 1 and 2.

The body tapers bluntly at its posterior end. In both collections from Magdala (Mejdal) was a specimen which showed a bifurcation of the caudal region; in one case (fig. 4) the peculiarity suggests a budding process.

Figure 1 shows the animal as it appears when cleared in

[1] Dr. Annandale informs me that the animals were dark grey in colour when collected, but that the fixative had the effect of changing the grey to brown. The fixative used was that recommended by Steinmann —30 cc. strong nitric acid, 30 cc. concentrated corrosive sublimate and 40 cc. dist. water.

cedarwood oil. The pharynx normally occupies the middle of the body, but its position may vary considerably; such variation is easily explained if the animal reproduces by transverse fission, for, at least in other species where this method is adopted, the constriction occurs immediately posterior to the mouth of the parent. The mouth is the only aperture present.

The alimentary canal forms a richly branched system, and in several specimens, as the one figured, it was specially prominent in the cleared animal; in other cases the branches of the gut were not so wide and appeared only as a delicate ramifying system.

It is particularly interesting to trace the course of the digestive system in the bifurcated caudal region of the specimen which showed this feature prominently. A glance at fig. 4, which was drawn with the aid of a camera lucida, shows that at the level of the mouth a well-marked branch is given off from the main posterior lateral branch, thus fully providing for the nutrition of this secondary part; moreover, this subsidiary gut will be seen to form a definite forking a little beyond half-way along its course in strong resemblance to that of the main body. Further, sectionizing proved that the nervous system was represented in the "limb" in the typical way, viz. by two lateral nerves. Without asserting it to be the case, the suggestion nevertheless occurs to one that a new individual could in this way be formed; a separation, the development of eyes and also of a muscular pharynx at the bifurcation of the gut, with the addition of a mouth, and the thing is done.

It has already been remarked that no trace of reproductive organs could be found; it must be concluded therefore that fission in some form occurs, at any rate at some period.

Planaria salina, n. sp. (Pl. xxvi, figs. 5 & 6.)

This species was collected in saline water near et-Tabghah. All the animals are very small and measure on an average 2·5 mm. and 1 mm. in length and breadth respectively; the largest was 3·2 mm in length and 1 mm. in breadth, and the smallest attained only a length of 1·6 mm. and a breadth of ·8 mm.

In colour they are distinctly pale; rather whitish with some small amount of dark brown more concentrated towards the middle line on the dorsal side, while the under surface is white.

The short head is typically triangular and merges gradually into the trunk, with no suggestion of a neck; in one instance (fig. 6) a shallow constriction was shown just behind the head, but it can scarcely be called a neck in the same sense as in the previous species. In one or two cases the head was rounded anteriorly.

The eyes occupy a forward position in the body, though

relatively far back on the head, being in line with the angle formed at the junction of the head and the trunk; they are closer to one another than to the side of the body, and no pigmentless area is distinguishable round them.

The auricular sense organs are not visible in the whole animal, but in section they are present as a patch of ciliated epidermis, devoid of rhabdites, with an underlying nervous felt-work situated at about the level of the eyes.

As a rule the animal tapers rather suddenly to a blunt point posteriorly. The gut is varied in appearance, sometimes showing as a branched system, while in others it is composed of comparatively broad secondary branchings or broad and lobate terminations to fine branches. The pharynx varies in position from the middle to almost the posterior extremity. Gonads are completely absent.

Planaria barroisi, n. sp. (Pl. xxvi, fig. 7.)

Among the Palestine collection was a planarian which probably corresponds to the "planaire noire indéterminée" referred to by Barrois[1] as being found in the Lake of Tiberias. Only a single specimen was collected, and from its brittle and contorted body appears to have been dead when collected; in spite of the greatest care to straighten the animal, it split across in two places. Owing to its wrinkled and contracted condition, the figure given is probably a poor representation of the form of the living animal, though it was drawn by the aid of Bausch and Lomb's excellent projection apparatus.

The length of the specimen is 6 mm., though its natural length is probably nearer 8 mm., and its breadth 1·6 mm.

Most probably in the living animal the head is distinctly triangular with a lappet on each side, immediately behind which would be a well-marked neck. Two eyes are present, situated about half way between the anterior end and the neck, and are about as far removed from each other as from the side of the head.

The auricular sense organs are very clearly seen as elongated clear areas exactly on the lateral head lobes.

The mouth, the only aperture on the ventral side, is placed 2 mm. from the posterior end, and in front of it is the pharynx, 1·3 mm. long and ·5 mm. wide, no trace of reproductive organs is to be seen.

In colour, dorsally the animal is a very dark brown, appearing black in spirit; ventrally the colour is somewhat paler. It appears to be quite a distinct species from *P. tiberiensis*, since its size, colour and particularly the prominence and

[1] Th. Barrois, "Contribution à l'étude de quelques lacs de Syrie." Revue Biologique du nord de la France T. VI., 1893 4, p. 254.

form of the auricular sense organs are quite unlike those of this species.

EXPLANATION OF PLATE XXVI.

Figures 1, 5 and 7 were drawn by the aid of Bausch and Lomb's projection drawing apparatus; figures 2, 3, 4 and 6 by camera lucida.

FIG. 1.—*Planaria tiberiensis* as seen when cleared in cedar-wood oil. Enlarged 12 times.

,, 2.—Form of head in same species, showing position and form of auricular sense organs (a. s. o.) Enlarged 20 times.

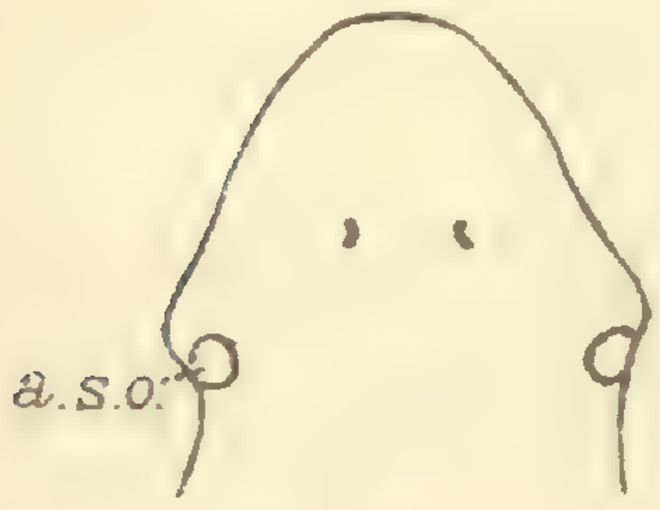
,, 3.—Form of the head of a young specimen of the same species. Enlarged 16 times.

,, 4.—Bifurcated caudal region of a specimen of the same species showing the course of the gut in the branch (to left of figure); ph. pharynx; g. gut; s. subsidiary lobe; m. main trunk.

,, 5.—*Planaria salina* as seen when cleared in cedar-wood oil. Enlarged 16 times.

,, 6.—Outline of another specimen of same species.

,, 7.—Head region of *Planaria barroisi* as seen when cleared in cedar-wood oil. Enlarged 12 times.



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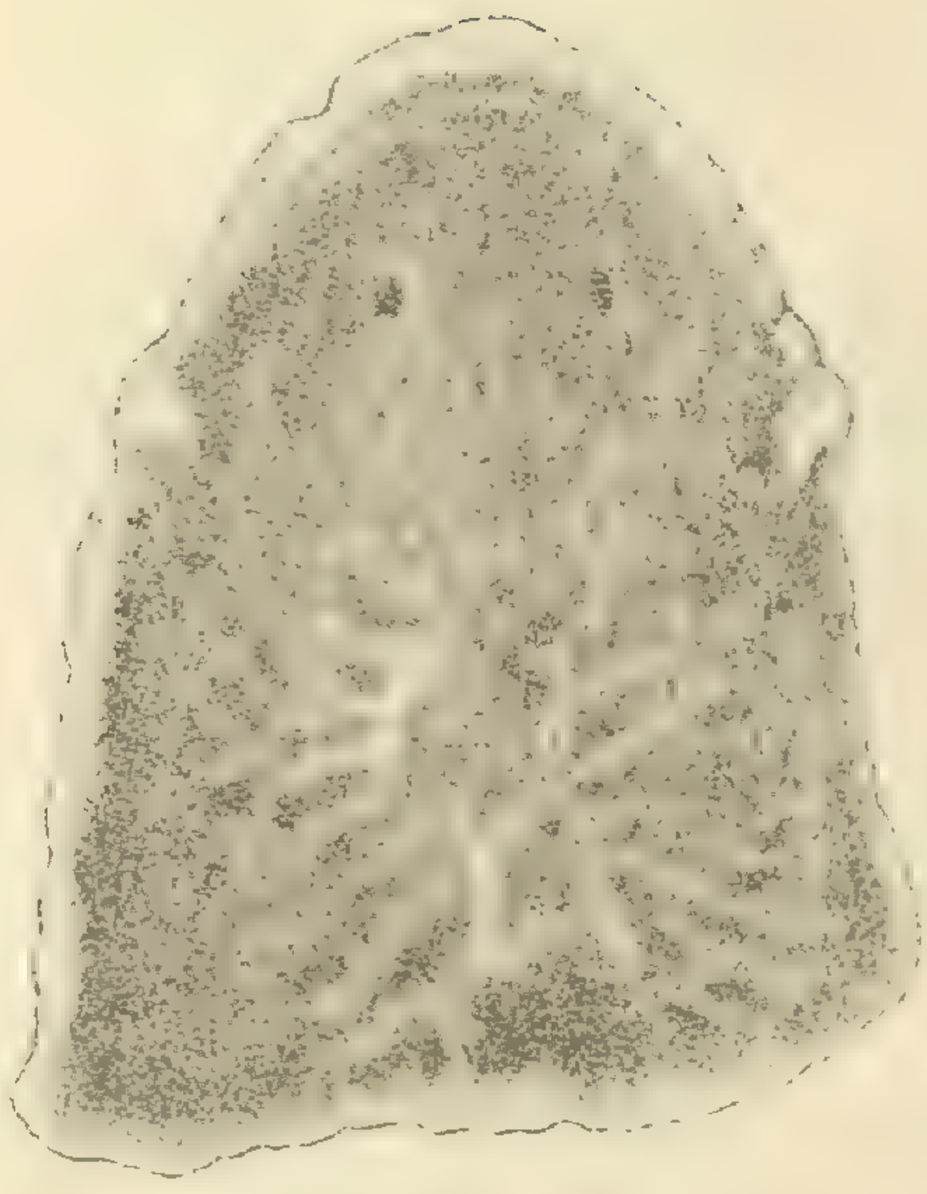
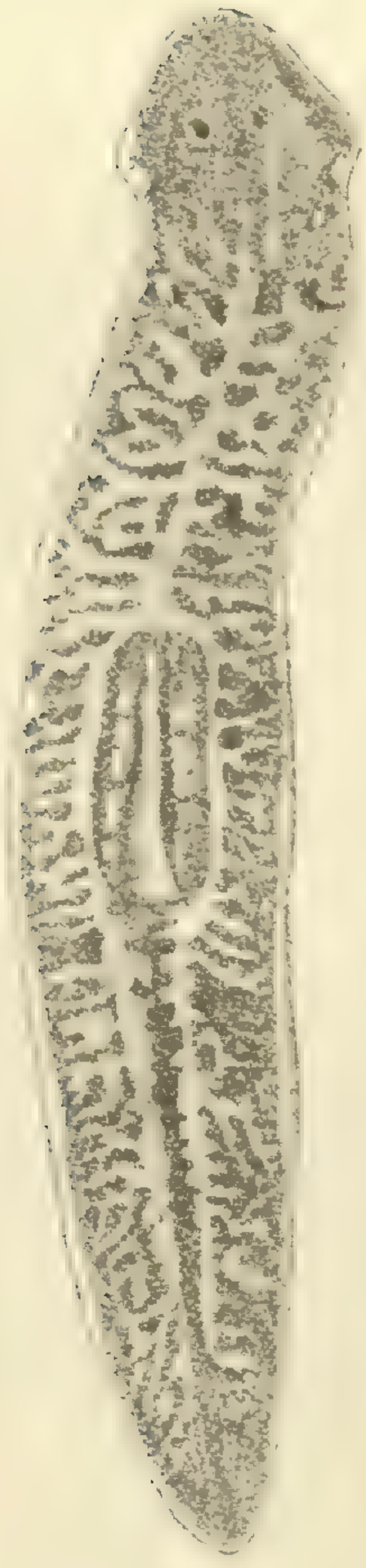
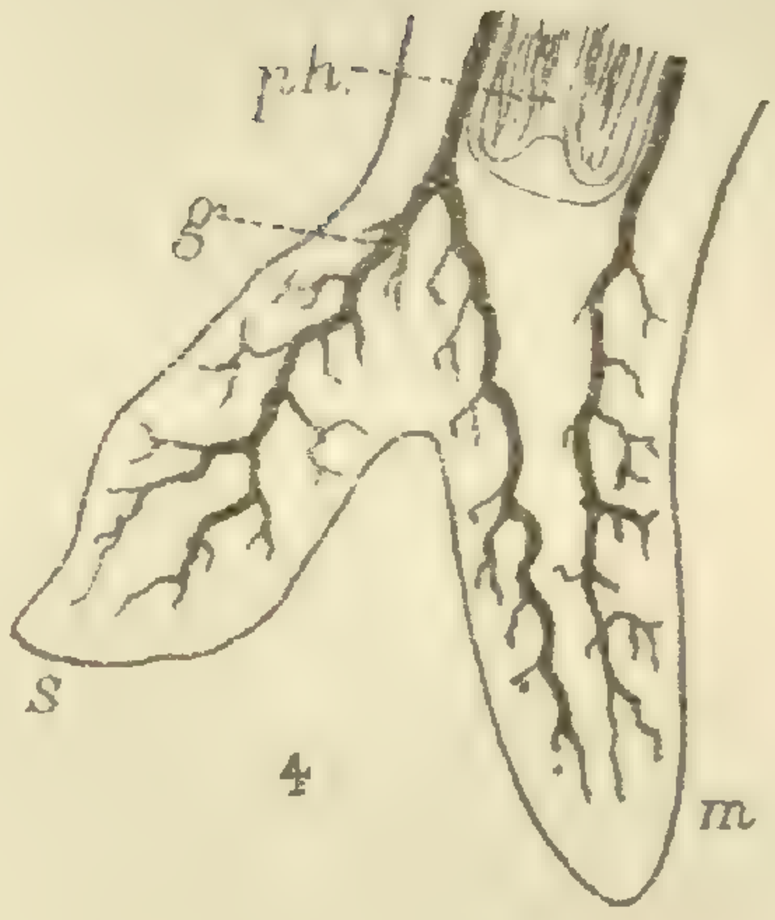


7 × 12.



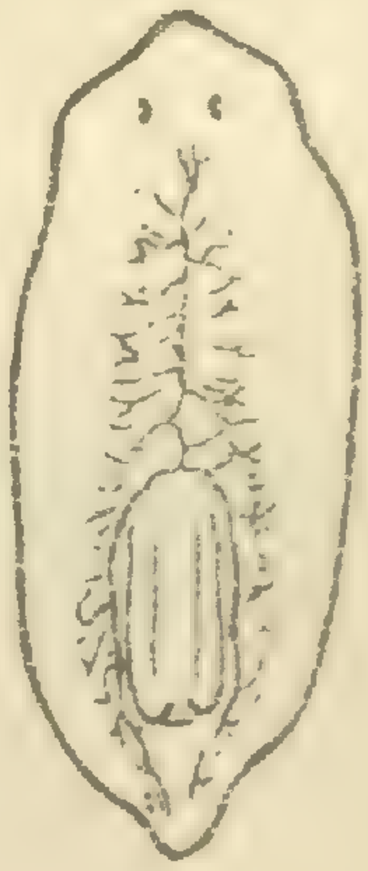
1 × 12.



4

5 × 16.

3 × 16.



6 × 16

PLANARIANS FROM PALESTINE.

50. A Molluscan Faunal List of the Lake of Tiberias, with Descriptions of new Species.

By H. B. Preston.

(Plate XXVII.)

The following paper is the result of a request by Dr. N. Annandale to identify an extensive collection of mollusca recently collected by him in the Lake of Tiberias, giving at the same time a molluscan faunal list of the Lake with the geographical distribution of each species.

The student of fluviatile and lacustrine mollusca will at once be struck by either the total absence or paucity in number of the thinner and more fragile genera, such as *Limnæa*, *Physa*, *Ancylus*, *Pisidium*, etc., while the heavier, "shelly" forms such as *Unio*, *Theodoxis*, and *Corbicula* appear to be well represented, a fact which is probably due to a surfeit of suspended mineral matter in the waters of the Lake.

The species enumerated are given on the faith of the various authorities who have been consulted in the compilation of the list, but the author himself in no way vouches for their specific validity, as many of them (notably those of Messieurs Bourguignat and Locard) have not been accessible to him.

In conclusion the author wishes to proffer his thanks to his friends Messrs. G. K. Gude and C. Legassicke-Crespin, to the former for much useful bibliographical assistance, and to the latter for valuable general information concerning the region in which he has travelled extensively.

Family LIMNÆIDAE.

1. Limnæa auricularia (Linné).

Distribution: Northern Europe, Siberia; two specimens which I am unable to separate from this species were collected by Dr. Annandale at the north end of the Lake: I am unable to find any other record of its having been collected in the Syrian Lakes.

[Those specimens were taken, with those of *Physa tiberiadensis*, in filamentous algae in a boat submerged in the R. Jordan at its entry into the lake.—*N. Annandale.*]

2. Limnaea virginea, sp. n.

(Plate XXVII, fig. 1.)

Shell obliquely subrectangular, moderately thin, pure white; whorls 3, the first very small, the third very large, inflated, marked with oblique growth striae only; suture impressed; columella very obliquely descending, then angled and obliquely and somewhat sinuously descending in the opposite direction, diffused above into an outwardly spreading, well defined, parietal callus which reaches to the upper margin of the labrum; labrum acute; aperture very large, broad and somewhat dilated below.

Alt. 5·75, diam. maj. 4, diam. min. 3 mm.

Aperture: alt. 4·5, diam. 2·75 mm.

Hab.—Semakh to exit of the River Jordan (Type); also W.-es Semakh (young specimens only) (Annandale).

[The type was taken in about 6 metres of water in the channel of the R. Jordan in the lake: those from Wad-es Semakh in a small shallow stream.—*N. Annandale.*]

Family PHYSIDAE.

3. Physa tiberiadensis, sp. n.

(Plate XXVII, fig. 2.)

Shell ovate, perforate, dark brown; whorls 4, rapidly increasing, convex, shouldered above, the last large, marked with rather coarse, transverse growth striae; suture impressed; umbilicus deep, moderately wide: columella margin somewhat vitreous, outwardly expanded and reflexed, rather vertically descending, extending above into a thickish, well defined, parietal callus which joins it with the upper margin of the labrum and gives to this almost the appearance of being continuous; labrum simple, slightly dilated at the base and very slightly bent inwards over the aperture above; aperture ovate.

Alt. 13·75, diam. maj. 9, diam min. 7 mm.

Aperture: alt. 7·5, diam. 5·5 mm.

Hab.—Mouth of River Jordan, N. end of Lake of Tiberias. among algae. (Annandale).

Family MELANIIDAE.

4. Melania tuberculata, Müll.

Mousson, *Coq. Terr. Prof. Roth, Zurich*, 1861, pp. 60·61, sp. 64.

Generally distributed throughout Southern Asia, N. and N. E. Africa, N. Australia and the Malay Archipelago.

Off the Jewish cemetery near Tiberias in 8½ metres; S. end

of Lake of Tiberias off Semakh in 4-5 metres; bed of Jordan at its exit from the Lake (dead specimens): between the exit of the River Jordan and Semakh, south end of the Lake (4–6 metres) (Annandale).

4a. Var. elongata, Locard.

Arch. Mus. Hist. Nat., Lyon, iii, 1883, pp. 225-226.
Occurring generally with the typical form. (Annandale).
[Living specimens of this species are only taken rarely at the edge of the lake; they are much more abundant in water of from 4 to 8 metres. Dead shells are extremely common in the R. Jordan at its exit from the lake.—*N. Annandale.*]

5 M. rothiana, Noress. (?=*tuberculata*, Müll.)

Tristram, *Proc. Zool. Soc., London*, 1865, p. 541.
Lake of Tiberias (Mousson, Tristram).

6. Melanopsis costata. Oliv.

Distribution: Spain, N. Africa, Syria. Dr. Annandale's collection contains examples from Tabghah, Mejdal, Wad-es-Semakh, Ain-et-Tineh and Lake of Tiberias generally, also from the River Jordan at its exit from the Lake and a single specimen of rather large size from a small mineral spring at Dalmanutha near Tiberias.

[This mollusc is extremely abundant in the lake, especially near the shore; it is found as deep as 22 metres. *N. Annandale.*]

6a. Var. jordanica, Roth.

J. R. Roth, *Moll. species*, 1839, p. 25, Pl. II, figs 12-13.
River Jordan (Roth, Tristram, Locard); Lake of Homs (Locard); Lake of Tiberias (Barrois).

6b. Var. degenerata, var. n.

(Plate XXVII, fig. 9.)

Differing from the typical form in its much smaller size and in being proportionately much narrower; it is also of a uniform purplish black colour.

Alt. 8·25, diam. maj. 4 mm.

Aperture: alt. 4, diam. 2 mm.

Hab.— Lake of Tiberias at the exit of the Jordan (Annandale).

7. M. buccinoidea, Oliv.

Locard, *Arch. Mus. Hist. Nat., Lyon*, Vol. III. pp. 204-205.
Syria generally.

8. **M. praerosa**, Lin.

Dautzenberg, *Rev. Biol. Nord France*, 1894, pp. 339-341.
Generally distributed throughout Syria. Dr. Annandale procured specimens from Tabghah, Mejdal, etc.; also in quantity from a small mineral spring at Dalmanutha near Tiberias and from the Barada River, Damascus.

[Much more abundant in running water than in stagnant. —*N. Annandale.*]

Family HYDROBIIDAE.

9. **Pyrgula** b.rroisi, Dtz.

Dautzenberg, *Rev. Biol. Nord France*, 1894, pp. 345-346.
Lake of Tiberias (Barrois); exit of Jordan from Lake of Tiberias (dead specimens only). (Annandale).

10. **Bithinia badiella**, Parr.

Dautzenberg, *T. C.* pp. 347-348.
Lake of Homs; Nahr el Leboueh; Tell el Kadi; Stream at Damascus; marshes of Ain el Musaieh; Lake of Tiberias (Barrois). Lake of Tiberias, on lower surface of stones; exit of River Jordan from the Lake, and from a small dirty pool near the east shore of the Lake.—(Annandale).

[Not uncommon under stones at the edge of the lake. —*N. Annandale.*]

11. **Bithinia gennesaretensis**, sp. n.

(Plate XXVII, fig. 8.)

Shell perforate, ovately fusiform, semitransparent, polished, shining, pale reddish yellow; whorls $4\frac{1}{2}$, rather rapidly increasing, convex, marked with transverse growth striae; suture impressed; umbilicus very narrow; columella descending in a rather angular curve, continued along the parietal wall in a thickish, re-tricted and well-defined callus to join the upper margin of the labrum; **labrum simple, dilated below; aperture** ovate; operculum calcareous, white, multilaminiferous, with central nucleus.

Alt. 7, diam. maj. 4·25, diam. min. 3 75 mm.
Aperture: alt. 3, diam. 2 mm.
Hab.—Semakh to exit of Jordan, Lake of Tiberias. (Annandale).

[Only taken in the channel of the Jordan in the lake.—*N. Annandale.*]

12. Bithinia semakhensis, sp n

(Plate XXVII, fig. 3.)

Shell ovately fusiform, smooth; whorls 4, regularly increasing, moderately convex, marked with transverse growth lines and on the upper whorls showing traces of spiral striation; suture impressed; columella curved especially above; labrum simple, continuous; aperture obliquely ovate.

Alt. 4·5, diam. maj. 2 5, diam. min. 2·25 mm.

Aperture: alt. 2, diam. 1·25 mm.

Hab.—Wad-es-Semakh, edge of Lake of Tiberias, from a small dirty pool. (Annandale).

[When the Lake is full, the pool in which this species was found must be joined to it.—*N. Annandale*.]

13. Bithinella contempta, Dautzenberg.

Rev. Biol. Nord France, 1894, p. 348.

Nahr-el-Haroun; Zerrâa: marshes of Ain-el-Musaieh: stream at Damascus; ford across the Jordan at El-Tell (Barrois): Mejdal, Lake of Tiberias. (Annandale).

14. Bithinella annandalei, sp. n.

(Plate XXVII, fig. 6.)

Shell small, imperforate, ovately fusiform with rather obtuse apex, pale greenish; whorls 5, the first very small, the second proportionately large, the remainder regularly increasing, smooth, without sculpture; suture lightly impressed, broadly margined below; columella gently curved, diffused above into a well-defined, parietal callus which reaches to the upper margin of the labrum; labrum simple, somewhat dilated at the base; aperture sub-elliptical.

Alt. 1·75 diam. maj. 1 mm.

Hab.—Ain-et-Tineh (Type), also octagonal pool at et-Tabghah and Mejdal, Lake of Tiberias. (Annandale).

15. Bithinella syngenes, sp. n.

(Plate XXVII, fig. 7.)

Shell differing from *B. annandalei* in its narrower, more elongate and more cylindrical form, though having the same number of whorls, in being subperforate, in its outwardly expanded and calloused columella and reflexed labrum, and in the shape of the aperture which is roundly ovate.

Alt. 2·25, diam. maj. 1·25 mm.

Hab.—Ain-et-Tineh, Lake of Tiberias, from small pool. (Annandale).

16. Bithinella galilaeae, sp. n.

(Plate XXVII, fig. 5.)

Shell imperforate, fusiform with acuminate spire, greenish; whorls 6, regularly increasing, flattish, marked with closely set, transverse striae; suture impressed; columella descending in an oblique curve; extending above into a well-defined, perietal callus which reaches the upper margin of the labrum; labrum acute, slightly dilated below and bent inwards over the aperture above; aperture ovate.

Alt. 3·75, diam. maj. 2 mm. (nearly).

Hab.—Wad-es-Semakh, Lake of Tiberias, in stream (N. Annandale).

17. Bithinella vexillum, sp. n.

(Plate XXVII, fig. 4.)

Shell moderately small, perforate, fusiformly conic, dark yellowish brown painted with narrow, equidistant, transverse bands of reddish chestnut; whorls 5, the first two small, the last three large in proportion, the last convex and bearing traces of microscopic, spiral striae; suture impressed; umbilicus somewhat narrow, deep; columella strongly arched above, gently curved below with erect, though slightly bent, margin extending above into a thick, well defined, parietal callus which unites it with the upper margin of the labrum; labrum simple; aperture ovate.

Alt. 2·5, diam. maj. 1·75 mm.

Hab.—Octagonal pool at et-Tabghah. (N. Annandale).

Family VALVATIDAE.

18. Valvata saulcyi, Brgt

Dautzenberg, *Rev. Biol. Nord France*, 1894, p. 349.

Birket-Kosseir; Homs; marshes of Orontes; Lake of Yamoûneh; stream at Damascus (Barrois).

Family NERITIDAE.

19. Theodoxis jordani (Sow.).

Dautzenberg, *T.C.*, pp. 349—351.

Lake of Homs; Ain Mallahah; Lake of Houleh; El-Tell, River Jordan; Capharnaum; Ain-et-Tineh (Barrois): Lake of Tiberias (Roth, Mousson, Bourguignat): River Jordan; Lakes of Houleh and Tiberias (Tristram): Wad-es-Semakh, Tabghah, Ain-et-Tineh, etc., Lake of Tiberias (Annandale).

[Very abundant on the lower surface of stones at the edge of the lake; occurs in at least 22 metres of water.—*N. Annandale.*]

20. T. michoni (Brgt).

Locard, *Arch. Mus. Hist. Nat., Lyon*, Vol. III, pp. 233—234.

Ain-el-Min, Syria; Tell-el-Kadi Nahr-el-Heroun; Ain-Mellahah; El-Tell, River Jordan: stream at Damascus; Ras el; Ain, near Naplouse; Bir Jaloûd; Ain-es-Sultan; Ain-Feschkah-Ain-Rhoneir; Ain-Djeddi (Barrois): Ain-et-Tineh, Lake of Tiberias and exit of the River Jordan from that lake (Annandale). Some of the specimens collected by Dr. Annandale, especially those from the exit of the Jordan, would appear to link up this and the preceding species, from which it would seem that the one is merely an extreme form of the other.

21. T. bellardi (Mouss.).

Mousson, *Coq. Terr., Prof. Roth, Zurich*, 1861, pp. 60-61, sp. 64.

Valley of B'ka, between Lebanon and Anti-Lebanon (Type): Lake of Tiberias.

Family UNIONIDAE.

22. Unio requieni, Mich.

Mousson, *Coq. Terr., Prof. Roth, Zürich*, 1861, pp. 66-67, sp. 73.

Entire circummeditteranean Region.

23. U. pietri, Locard.

Arch. Mus. Hist. Nat., Lyon, Vol. III, pp. 210-211.

Lake of Tiberias (Lortet); Lake of Tiberias and exit of River Jordan from the lake (Annandale.)

24. U. tiberianensis, Let.

Locard, *T.C.*, pp. 216-217.

Lake of Tiberias (Letourneux).

25. U. tristrami, Loc.

T.C., pp. 209-210.

Lake of Tiberias (Lortet). North end of the Lake of Tiberias at the mouth of the River Jordan (Annandale).

26. U. terminalis, Brgt.

Bourguignat, *Test. Nov. Saulcy*, 1852, p. 31, No. 9; *Cat. rais. Moll. Terr. Fluv. Saulcy, Paris*, 1853, pp. 76-77, pl. III, figs. 4-6.

Lake of Tiberias (Dr. Saulcy, Annandale).

By far the greater part of Dr. Annandale's collection is composed of the present species, the series ranging from quite young specimens to what are apparently adult and which correspond in every way to specimens in the British Museum labelled as having been collected by Dr. Tristram in the Lake of Tiberias. Bourguignat's figures are of somewhat larger shells, but in all other respects they agree absolutely with the above.

The following are the dimensions of Dr. Annandale's largest specimen taken with many smaller examples at the exit of the R. Jordan.

Long. 35·25, lat. 62, diam. 28·25 mm.

[Occurs in the lake at depths of from less than 1 to over 22 metres.—*N. Annandale.*]

27. U. jordanicus, Brgt.

Mousson, *Coq. Terr*, *Prof. Roth. Zürich*, 1861, p. 66, sp. 72.
River Jordan (de Saulcy); Lake of Tiberias.

28. U. zabulonicus, Brgt.

Locard, *Arch. Mus. Nat. Hist., Lyon*, Vol. III, pp. 220-221.

Lake of Tiberias (Letourneux).

29. U. prosacrus, Brgt.

T.C., p 219.
Lake of Tiberias (Lortet, Letourneux, Annandale).

30. U. littoralis, Lk.

Mousson, *Coq. Terr.*, *Prof. Roth. Zürich*, 1861, p. 64, sp. 70.
Southern Europe; Asia Minor; Syria; Morocco, Algiers.

31. U ellipsoideus, Brgt.

Locard, *Arch. Mus. Hist. Nat.*, *Lyon*, Vol. III, pp. 211-212.
Lake of Tiberias (Bourguignat).

32 U. genezarethanus, Let

T.C., pp. 213-214.
Lake of Tiberias (Letourneux).

33. U. rothi, Brgt.

T.C., pp. 204-205.
Lake of Tiberias (Roth.); River Jordan (Lortet).

34. U. simonis, Tristrami.

Proc. Zool. Soc., London, 1865, p. 544.
Recorded from Lake of Tiberias; River Jordan, River Orontes; River Leontes; Lake of Antioch: also "off Semakh" and at other places in Lake of Tiberias (Annandale).

The several specimens obtained from the Lake by Dr. Annandale, though showing slight variation can all undoubtedly be referred to this species.

[The beautiful pink iridescence of the nacre fades considerably in a short time.—*N. Annandale.*]

35. U. galilaei, Loc.

Locard, *Arch. Mus. Nat. Hist., Lyon*, Vol. III, pp. 206-207.
Lake of Tiberias (Lortet, Letourneux); off Semakh and from Semakh to the exit of the River Jordan, etc. (Annandale).

36. U. raymondi, Brgt.

T.C., pp. 208-209.
Lake of Tiberias (Bourguignat).

37. U. lorteti, Locard.

T.C., pp. 215-216.
Lake of Tiberias (Lortet, Letourneux).

38 Unio chinnerethensis, sp. n.

(Plate XXVII, figs. 10, 10a.)

Shell elongately ovate, rather thin, pale yellowish olive, both valves marked with concentric growth lines, obliquely angled in a posterior direction from the umbones downward and corrugatedly sculptured between the angle and the dorsal margin; umbones rather large, not very prominent, rather coarsely, corrugatedly, nodulously sculptured; dorsal margin straight above angled and sloping posteriorly; ventral margin very gently curved; anterior side bluntly rounded; posterior side also bluntly rounded and sloping below; left valve bearing a small, elongate and slightly jagged cardinal tooth which fits into a slight hollow on the hinge plate of the right valve; anterior lateral tooth in right valve erect, broadly triangular; in left valve short and somewhat coarsely granulate; posterior lateral in right valve moderately elongate, rather erect, slightly curved; in left valve elongately bifurcated to receive the lateral of the right valve, also slightly curved; anterior scars in both valves deeply impressed, posterior scars lightly so; interior of shell nacreous, pale bluish white.

Long. 23·5, lat. 39·5, diam. 16·5 mm.
Hab.—Lake of Tiberias (Annandale).

Family CYRENIDAE.

39. Corbicula fluminalis (Mull.).

Bourguignat, *Cat. rais. Moll. Terr. Fluv. Saulcy.*, *Paris* 1853, p. 79.

Distribution: Southern Asia, North, East, West and Central Africa. Taken by Dr. Annandale at Mejdal, Wad-es- Semakh, from Semakh to the exit of the River Jordan and other localities in the Lake of Tiberias.

40. C. cor. Lk.

Tristram, *Proc. Zool. Soc.*, *London*, 1865, p. 543.
River Jordan, Lake of Huleh ; Lake of Tiberias (Tristram).

41. C. crassula (Mousson).

Mousson, *Coq. Terr. Fluv. Bellardi*, 1854, p. 54, pl. XII.
Lebanon : also Lake of Tiberias (Annandale).

Dr. Annandale's collection contains a number of specimens which agree very well with Mousson's type specimen in the British Museum, of which the dimensions, together with those of Dr Annandale's largest and smallest specimens, are as follow :—

	Long.	Lat.	Diam.
Type ..	13·5	13	10·75 mm.
Largest ..	25	24	19·25 mm.
Smallest ..	12·5	13	9·75 mm.

The species may very possibly ultimately prove to be but a variety of the preceding.

42. C. syriaca, Brgt.

Locard, *Arch. Mus Nat. Hist.*, *Lyon*, Vol III, pp. 223-224.
Shore at Tiberias (Annandale). The species is also recorded from Antioch and Homs.

43. C. feliciani, Brgt.

Lake of Tiberias, a single specimen, agreeing with the figures of this species, collected by Dr. Annandale.

EXPLANATION OF PLATE XXVII.

FIG. 1. *Limnaea virginea*, sp. nov.
,, 2. *Physa tiberiadensis*, sp. nov.
,, 3. *Bithinia semakhensis*, sp. nov.
,, 4. *Bithinella vexillum*, sp. nov.
,, 5. *Bithinella galilaeae*, sp. nov.
,, 6. *Bithinella annandalei*, sp. nov.
,, 7. *Bithinella syngenes*, sp. nov.
,, 8. *Bithinia gennesaretensis*, sp. nov.
,, 9. *Melanospsis costata*, Oliv., var. *degenerata*, nov.
FIGS. 10, 10*a*. *Unio chinnerethensis*, sp. nov.

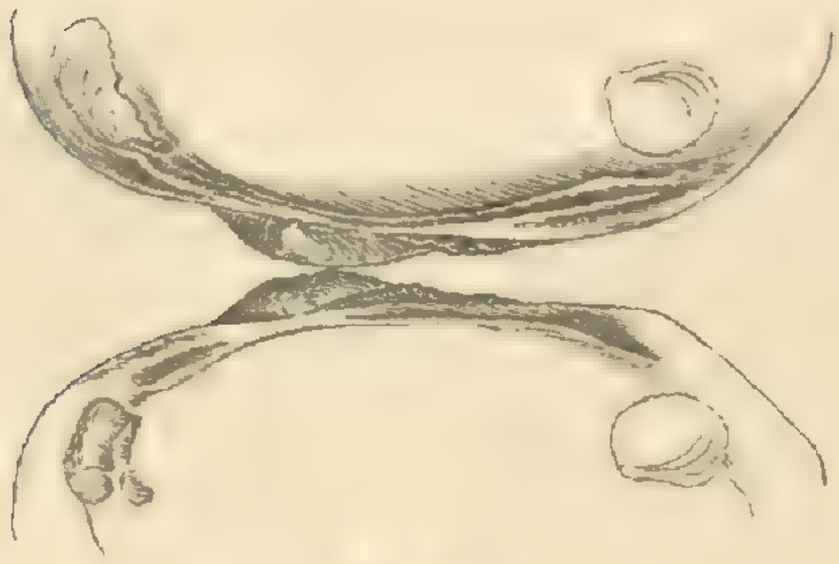


Fig 10a

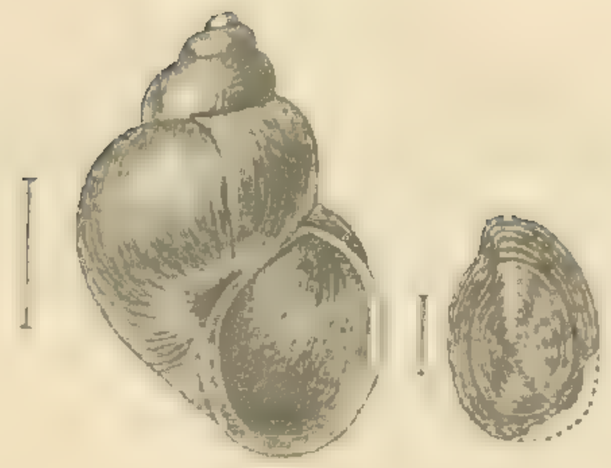


Fig 8

Fig. 7.

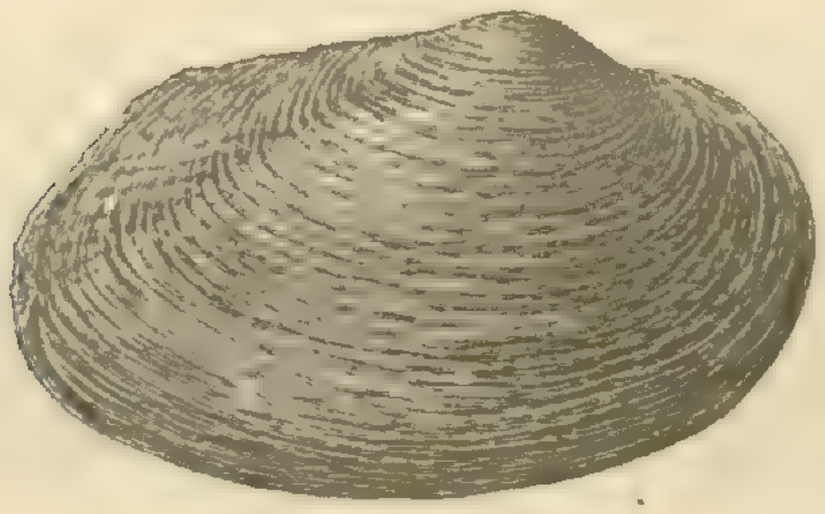


Fig 10

Fig. 6.

Fig 1

Fig. 3.

Fig. 5.

Fig. 2.

Fig 4

NEW SHELLS FROM THE LAKE OF TIBERIAS.

Photogravure - Survey of India Offices, Calcutta. 1914

51. Aquatic and semi-aquatic Rhynchota from the Lake of Tiberias and its immediate vicinity.

By Dr. G. Horvath.

(*Communicated by* Dr. N. Annandale.)

(With 2 figures.)

The collection of Rhynchota made by Dr. N. Annandale contains—beside two specimens of a terrestrial species (*Scantius aegyptius* L.) common in dry places in the N. Mediterranean region, and some undeterminable larvae belonging to the genus *Gerris*—79 specimens of aquatic and semi-aquatic Rhynchota. These represent 21 species, three of which are new to science, viz. *Ochterus strigicollis*, *Micronecta annandalei* and *M. perparva*.[1]

This small collection shows, in general, the characters of the South-European fauna, but it bears in some respects those of the fauna of Egypt, as the following 5 species: *Mesovelia vittigera* Horv., *Limnogonus aegyptiacus* Put., *Nabaandelus bergevini* Bergr., *Plea letourneuxi* Sign and *Micronecta isis* Horv. were hitherto recorded from the latter country only. *Rhagovelia nigrians* Burm., a widespread species in the Ethiopian and Oriental regions, is confined in the Palaearctic region to Syria and Egypt. *Ranatra vicina* Sign. described originally from Egypt and recorded since from South Persia and the western parts of the Ethiopian region (Ogowe, Congo) was hitherto not known from Syria.

Semi-aquatic species.

1. *Hebrus pusillus* Fall.—Edge of the Lake of Tiberias, under stones, 2 ♂♂, 1 ♀; Wad-es-Semakh, 2 ♀♀.

2. *Mesovelia vittigera* Horv.—Plain of Gennesaret, 1 ♀; Tiberias, 1 ♂. Both specimens apterous.

3. *Dipsocoris alienus* H. Sch.—Edge of the Lake of Tiberias, under stones, 1 ♂.

4. *Hydrometra stagnorum* L.—Wad-es-Semakh, 1 apterous ♀.

5. *Gerris paludum* Fabr.—Plain of Gennesaret, 2 ♀♀, 2 nymphs, Wad-es-Semakh, 1 ♂, 2 ♀♀. All adult specimens

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[1] The types of these species will be preserved in the Indian Museum. —*N. A.*

belong to the brachypterous form, with the elytra reaching about to the middle of the abdomen.

6. *Limnogonus aegyptiacus* Put.—Plain of Gennesaret, 2 ♂ ♂, 2 ♀ ♀. All the specimens are apterous with the meso- and metanotum and the abdomen above shining black. The abdomen of the ♀ ♀ is marked above in the middle with a very narrow longitudinal yellow line.

7. *Naboandelus bergevini* Berg.—Plain of Gennesaret, 1 ♂, ♀ 1; Wad-es-Semakh, 2 ♀ ♀.

8. *Rhagovelia nigricans* Burm.—Plain of Gennesaret, 8 ♀ ♀; Wad-es-Semakh, 1 ♀; mouth of Jordan, 1 ♀. The two latter specimens are macropterous, the others apterous.

9. *Microvelia pygmaea* Duf.—Plain of Gennesaret, 1 ♀; Wad-es Semakh, 1 ♀.

10. *Patapius spinosus* Rossi var. *nigriceps* Horv.—Edge of the Lake of Tiberias, under stones, 1 ♂. This variety is known only from Syria.

11. *Erianotus lanosus* Duf.—Edge of the Lake of Tiberias, under stones, 2 ♀ ♀.

12. *Acanthia variabilis* H.-Sch. var. *connectens* Horv.—Wad-es-Semakh 1 ♂. The single specimen differs from the European form in the shorter hairs of the surface, the shorter antennae and legs, as well as in the less produced membrane: the whitish marginal spot before the middle of the elytra is not extended on to the mesocorium, but limited to the ectocorium; the black colour of the femora is more extended.

13. *Ochterus strigicollis* n. sp.—Niger, opacus; capite antrorsum declivi, nitidulo, transversim subtilissime ruguloso, vertice oculo paullo latiore, basi pone ocellos opaco, apice frontis clypeoque eburneis, laevigatis; oculis modice sursum vergentibus, ab antico visis apice quam vertice haud altioribus; articulis duobus basalibus antennarum albidis; pronoto duplo latiore quam longiore, impresso-punctato, guttis picturisque nonnullis obsoletis glaucis ornato, macula parva basali media margineque angusto postico versus latera flavo-testaceis, macula illa nigro-punctata, marginibus lateralibus explanatis sensim modice arcuatis et mox ante medium striola obliqua flavo-testacea notatis; scutello puncto basali medio glauco signato; elytris abdomine paullo longioribus, guttis sat numerosis glaucis ornatis, margine laterali maculis quatuor parviusculis flavo-testaceis notato, membrana glauco-conspersa; acetabulis anticis anguste albido-marginatis; pedibus albido-testaceis, coxis apiceque imo femorum, tibiarum et tarsorum nigris, tibiis posticis spinulis obscure testaceis, e punctis nigris nascentibus praeditis. Long. $5\frac{1}{2}$ mill.

Wad-es Semakh, 1 ♀.

Differs from *O. marginatus* Latr. in the more prominent head, the less elevated eyes, the somewhat narrower, less rounded margins of the pronotum, which are marked only with

a pale oblique streak (fig. 1), and the narrowly pale-margined anterior acetabulae.

The laminately ampliated lateral margins of the pronotum of *O. marginatus* Latr. are broader, more rounded and almost entirely pale, black only at the anterior angle (fig. 2). The exterior angle of the eyes, seen from before, is more elevated than the vertex.

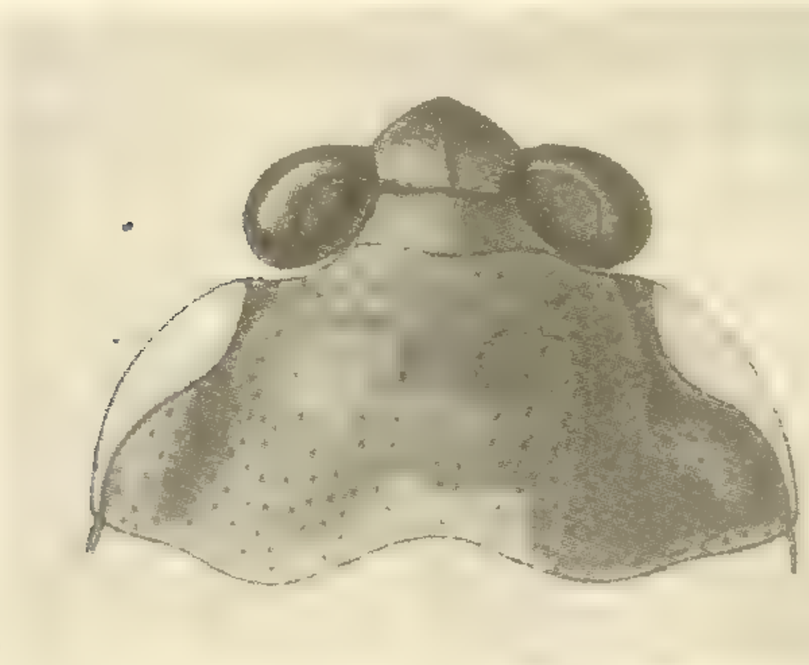

Fig. 1.—*Ochterus strigicollis* n. sp. Head and pronotum.

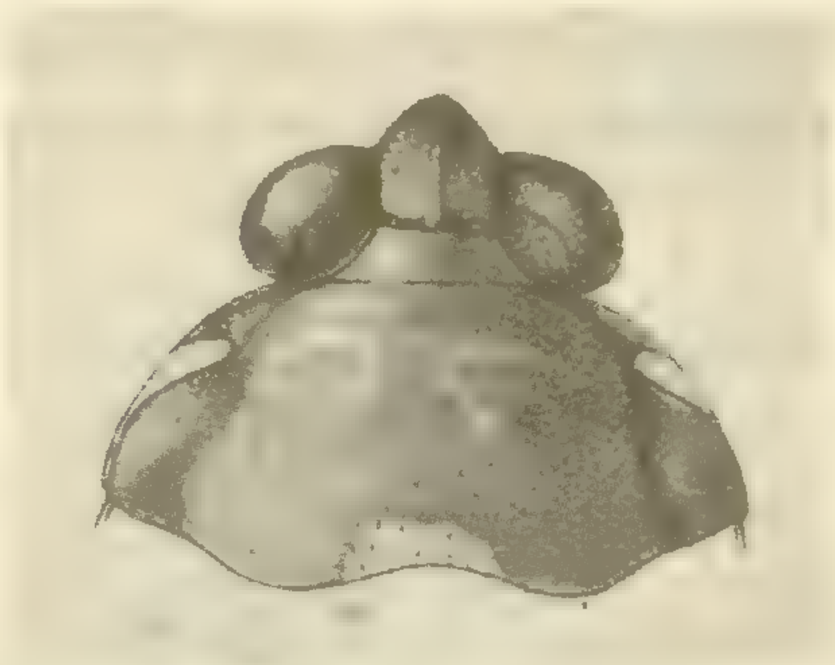

Fig 2.—*Ochterus marginatus* Latr. Head and pronotum.

Aquatic species

14. *Ranatra vicina* Sign.—Octagonal pool at et-Tabghah, 2 ♂ ♂, 2 ♀ ♀.

15. *Plea letourneuxi* Sign.—Limestone basin at Ain-et-Tineh, amidst *Ranunculus aquatilis*, 4 specimens

16. *Anisops producta* Fieb.—Plain of Gennesaret. 2 ♂ ♂, 3 ♀ ♀ : mouth of Jordan, 3 ♂ ♂, 5 ♀ ♀

17. *Notonecta glauca* L.—Plain of Gennesaret, 1 specimen.

18. *Arctocorisa hieroglyphica* Duf.—Plain of Gennesaret 1 ♂ : edge of the Lake of Tiberias, 1 ♀ ; Wad-es-Semakh, 3 ♂ ♂, 6 ♀ ♀.

19. *Micronecta annandalei* n. sp.—Oblonga, glabra, subnitida, subtus cum antennis et pedibus pallida; capite flavo-albido, antrorsum parum producto, pronoto fere aequilongo, vertice laevigato, medio quam prope oculos paullo longiore, linea mediana subtili fusca, postice abbreviata notato ; pronoto longitudine sua media duplo et dimidio latiore, fusco, laevigato, antice et postice leviter arcuato, marginibus lateralibus distinctis, subobliquis ; scutello fusco ; elytris dense subtilisimeque punctulatis, fusco-griseis, margine scutellari clavi late flavo-testaceo, corio impressionibus longitudinalibus obsoletis instructo, fossula subcostali longa, retrorsum pone medium elytrorum extensa, membrana elytri sinistri hyalina. Long. $4\frac{1}{4}$ mil.

Wad-es-Semakh, in small dirty pool at edge of Lake of Tiberias, 1 ♀.

Allied to *M. plicata* Costa, but distinguished by the larger

size of the body and the almost equal length of the head and pronotum, as well as by the more transverse pronotum, the anterior and posterior margins of which are less arcuated.

20. *Micronecta isis* Horv.—Plain of Gennesaret, 2 ♂ ♂, 2 ♀ ♀; Wad-es-Semakh, 1 ♀.

21. *Micronecta perparva* n. sp.—Oblongo-ovata, albida, laevigata, glabra, nitidula; capite antrorsum fortiter producto et quam pronoto fere duplo longiore (12: 7), vertice medio quam prope oculos distincte longiore, linea mediana subtili subpercurrente rubra striolaque utrinque apicali nigricante ornato; pronoto brevi, longitudine sua media fere triplo et dimidio latiore, antice et postice levissime arcuato, marginibus lateralibus fere nullis, margine postico linea subtilissima, sed optime determinata nigra notato; scutello distincte transverso; elytris striolis nonnullis longitudinalibus fuscescentibus, sed obsoletis signatis, sutura clavi angustissime nigra, margine costali corii strolis binis nigricantibus notato, fossula subcostali longa, retrorsum pone medium elytri extensa; femoribus et tibiis posticis subtus linea subtilissima percurrente nigra pictis, tarsis posticis apice nigris. Long. $1\frac{1}{5}$ mill.

Tiberias, on the surface of the lake, at night, 1 ♀.

This fine species to be placed near *M. capitata* Horv. from which it differs by the smaller size, the whitish colour of the whole surface, the well-determined black line on the hind margin of pronotum, the more transverse scutellum and by the black lines on the ventral surface of the hind femora and tibiae.

Note. The numeration of the articles below is continued from p. 559 of the "Journal and Proceedings" for 1912.

(With plates X–XI.)

122. A find of Ephthalite or White Hun Coins.

In December 1911, during the course of excavations made by Mr. H. Hargreaves on behalf of the Archæological Department of India at Kanishka's *chaitya*, Shahji ki Dheri, North-West Frontier Province, a rouleau of sixteen Ephthalite or White Hun coins was found at a spot sixteen feet west of the main monastery wall. I have been allowed to publish these coins, the types of which are in the first of the two plates illustrating this paper.

It is probable that the rouleau was originally wrapped in cloth. The coins appeared to be of copper, but this turned out to be a superficial deposit only, and was easily removed. On analysis the coins were found to be silver with a small admixture of copper.

The specimens illustrated are ten in number, the reverse sides of all exhibiting the usual fire altar and its guardians. The first is obviously a double-struck coin, the original being an ordinary Sassanian silver piece. Nos. 2 to 5 appear to me to be identical in type, and there were seven specimens like these. The Brahmi character *she* appears behind the bust. Coin No. 7 is different, and bears the Brahmi character *cha*; probably No. 6 is the same as No. 7. Coins Nos. 8 and 9 are single specimens, while there were four like No. 10. The design in the left lower field of No. 10 may be a mere ornament, or may be the character *thai* reversed.

Coin No. 10 is the only one which appears to have been previously published—see Sir A. Cunningham's monograph on the coins of the Ephthalites or White Huns, Plate VIII, No. 14. [Num. Chron. 1894]. He describes the legend on the coin as being in unknown characters. All the coins now described exhibit legends in the same language which I suppose is a Turki or Tartar tongue, or they may possibly be attempts to portray some known language. I may instance the coins with corrupt Greek inscriptions described in Cunningham's paper.

The White Hun symbol is prominent on these coins, and must have been adopted by the Ephthalites from the Sassanians, because this nomad horde had no money or

written language of its own at the time of its collision with the Sassanians, and it was customary for the victorious White Huns to adapt the coinage of the conquered races to their own use. The type illustrated as Coin No. 1 on Plate I may be termed the purely Sassanian type of White Hun coinage, and the distinctive symbol is akin to that found on Sassanian coins , very like the planetary symbol used by the Indo-Parthian king Gondophares. When the Ephthalites invaded India they struck coins of Indo-Sassanian types exhibiting legends in Brahmi characters. So Coins Nos. 2 to 10 belong to a type intermediate between the Sassanian and Indo-Sassanian, as they bear a Brahmi character in the field, but the legends have not become Indian. This accords well with their find-spot on the Indian Frontier. An interesting and clear description of the various types of White Hun coin is contained in Mons. E. Drouin's paper "Le type monétaire sassanide et le monnayage indien." (Mémoires du Congrès International de Numismatique de Paris, 1900).

I add a few supplementary remarks on some Indo-Sassanian coins, and an Indo-Greek intaglio, in my own collection. These are illustrated in the second plate.

No. 11. Cp. Cunningham, "Coins of the Litttle Kushāns" (Kidāra Shāhi), Pl. VI, 1 (Num. Chron. 1893). The coin described by Sir A. Cunningham was a silver piece of a Sassanian type, but bearing a Brahmi legend *Kidāra Kushāna Shāhi*. The word *Kushāna* is quite distinct on the copper coin now described, which is a new type. It is almost identical with the smaller piece, Coins of the White Huns (Cunningham, Num. Chron. 1894), Pl. IX, 23, but the inscriptions differ.

No. 12. This is similar to White-King Sale Catalogue, Part I, No. 864. The reverse merely consists of the Ephthalite symbol within a double circle. It may be a coin of Napki Malka—Cp. Cunningham, "Coins of the White Huns," Pl. X, 2.

No. 13. This coin is akin to the money of Napki Malka. It bears the White Hun symbol, and a legend in what may be corrupt Greek characters . . . . *oshano.*

No. 14. A good specimen of the very rare silver coinage of the White Hun monarch Mihirakula. The legend in Brahmi characters reads quite clearly *Jayatu Mihirakula.* In front of the bust of the king are a trident, and sitting bull, and behind it is a spear, or spear-headed standard.

No. 15 and **No. 16.** Specimens of a silver coin exhibiting the bust of a king in front of which is the sun-standard. Over it in Brahmi characters are the word *Jayatu*, and the name of the king which has been read as Balāsara, Bagamsāra, or Baysāra. The name appears to be new.

No. 17. A silver piece with bust of king to right: to r., symbol; to l., White Hun symbol. Above are the Brahmi

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WHITE HUN COINS. N. S. XXI. ART 122

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words [Shāhi] Jarukha. This is a new name. Coin No. 13, Pl. VIII of Cunningham's "Coins of the White Huns," is a very similar piece, but the name on that is Jabula.

No. 18. Cp. "Coins of the White Huns," Plate IX, No. 1. Cunningham read the inscription as Vaiga, but it may be Khega, or Khege.

No. 19. Cp. "White-King Sale Catalogue," Part I, No. 890. The object in front of the bust looks like a closed umbrella. There was probably an inscription to right and left of the upper field, but this is off the coin.

No. 20. An intaglio probably in agate, of good artistic execution. The male figure is nude except for a waist-cloth, and carries a bow and arrow. To the right is a Kharoshṭhi legend which I read as *Sagavatigasa*.

The reverse sides of Coins Nos. 11 to 19, with the exception of No. 12, are of the usual Sassanian type.

R. B. Whitehead.

123. The Oldest British Murshidābād Rupee.

A most difficult problem has always been to distinguish the native-fashioned Murshidābād rupees into three series:—

1st—those coined at Murshidābād by the Nawāb of Bengāl;
2nd—the same coined under British control; and
3rd—those struck at Calcutta by the Company; all three sets bearing the mint-name Murshidābād.

The latest contribution to this question is, so far I am aware, a paper of Mr. H. N. Wright in J.A.S.B. 1904 (Num. Suppl. No. 28) which can be resumed as follows:—

(*a*) Between 1171 and 1176 A.H. the Company's Mint at Calcutta issued rupees with the name "Kalkatta" كالكتة; after that date the name Calcutta disappears altogether;

(*b*) all Murshidābād rupees till and including the fifth regnal year of Shāh 'Ālam (1178) are purely native issues;

(*c*) the Murshidābād rupees bearing the regnal years sixth, seventh, eighth and ninth are British coins from Murshidābād, the Calcutta Mint being closed during this period;

(*d*) from the regnal year tenth (1183 A.H.) onwards all the Murshidābād rupees were issued from the Calcutta Mint, the Murshidābād Mint having been closed for ever at this date.

Hitherto, the Murshidābād rupee of the fourth regnal year (1176) of Shāh 'Ālam has remained unknown; even the Dinājpūr find, unearthed after the publication of J. M. C. Johnston's paper "Coinage of the East India Company" (Num. Chron. 1903), and containing 119 native-style Murshidābād rupees, did not offer a single piece of that date; it seems that no coins were issued from the native *atelier* at Murshidābād during this year.

A most remarkable coin in my cabinet poses a new riddle:

it is a rupee of Murshidābād, fourth regnal year, 1176 A.H. (1762–3) in all particulars resembling the piece of Calcutta No. 67, Brit Mus. Cat. It is undoubtedly of European fabric, struck from a highly polished die, well engraved, perfectly round and of a superior workmanship. Whether it is struck in a ring or from a free die is not easy to decide, the edge having probably been hammered.

I would believe this rupee to be a proof pattern of the Calcutta Mint, designed after the order to suppress the word "Calcutta" on the dies of this mint. The pattern and the European fashion not having been approved, the mint at Calcutta was closed and the operations continued in the native style in Murshidābād, till the tenth regnal year (1183 = 1770); at this date the mint was again, and for ever, removed from Murshidābād to Calcutta.

E. V. ZAMBAUR,
Wiener-Neustadt, Austria.

124. THE MINT-TOWN ZAIN-UL-BILĀD.

This name is only found on the coins of Muḥammad Shāh bearing the date of the first five or six years of his reign. The term which means "The Glory of Cities" has rightly been distinguished from Zīnat-ul bilād, "the Adornment of Cities," though the difference is very small and it has hitherto been thought wise not to assume that it, like Zīnat-ul-bilād, is an epithet or synonym of Aḥmadābād.

Dr. Taylor has pointed out to me that the period during which the term is found is entirely unrepresented by any coins from Aḥmadābād.

The presumption for the ascription of the epithet to Aḥmadābād is thus strengthened and an extract from the Mir'āti Aḥmadī (Bombay Lith. ed. of A.H. 1306, Vol. II) confirms it. After the usual preface we find the words 'Baldat-i-Zain-ul-bilād Aḥmadābād,' 'The City of Aḥmadābād, the Glory of Cities.' On page 4 of the same edition, it is mentioned that the city is also called "Zīnat-ul-bilād" and "'Urūs-i-mamlikat"

(the Bride of the Realm). I have never met with the latter epithet.

I have also been shown a Persian document, in which Aḥmadābād is called "Baldat-i-Maḥfūẓa Zain-ul-bilād Aḥmadābād," "The Walled City, &c." The document is dated A.H. 1169, a few years after the close of Muḥammad Sẖāh's reign, and I am told that it is a common thing for documents drawn up in Aḥmadābād about this period to use the epithet, which is the subject of this note.

A. MASTER.

Surat.

PROCEEDINGS

For the year

1913

JANUARY, 1913.

The Adjourned Monthly General Meeting of the Society was held on Wednesday the 8th January, 1913, at 9-15 P.M.

COLONEL G. F. A. HARRIS, C.S.I., M.D., F.R.C.P., I.M.S., President, in the chair.

The following members were present:—

Maulavi Abdul Wali, Dr. N. Annandale, Dr. W. A. K. Christie, Mr. F. Doxey, Mr. T. P. Ghosh, Mr. F. H. Gravely, Mr. H. G Graves, Mr. H. H. Hayden, C.I.E., Mr. D. Hooper, Dr. W. C. Hossack, Mr. S. W. Kemp, Dr. Indumadhab Mallick, Capt. R. B. Seymour Sewell, I.M.S., Mr. G. Stadler, Dr. Satis Chandra Vidyabhusana, Rev. A. W. Young.

Visitors:—Dr. W. M. Haffkine, Miss A. Karpeles, Miss S. Karpeles, and another.

The minutes of the last meeting were read the confirmed.

Forty presentations were announced.

The General Secretary reported the death of Raja Binay Krishna Deb Bahadur and Pandit Mohanlal Vishunlal Pandia.

The Council reported that there was a vacancy in the list of Associate members, and therefore recommended Mr. Ekendranath Ghosh, L.M.S., B.Sc., Asst. Prof. of Biology, Medical College, Calcutta, for election as an Associate member at the next meeting.

The following gentlemen were balloted for as Ordinary Members:—

Capt. J. H. Burgess, I.M.S., Government Place, proposed by Major L. Rogers, I.M.S., seconded by Capt. J. D. Sandes, I.M.S.; *Count Karl L. Luxburg*, Imperial Consul-General for Germany, proposed by Dr. N. Annandale, seconded by Mr. S. W. Kemp; *Mr. P. C. Dutt*, Bar.-at-Law, Jubbulpore, proposed by Mr. H. H. Hayden, C.I.E., seconded by Dr. W. A. K. Christie; *Col. S. G. Burrard*, C.S.I., F.R.S., proposed by Dr. N. Annandale, seconded by Mr. S. W. Kemp.

The following papers were read:—

1. *On a New Series of the Double Sulphate of Barium with Sulphates of the Hetero-cyclic Ammonium Bases.* *By* RASIK LAL DATTA and HARIDAS SEN, Part I. *Communicated by* DR. P. C. RAY.

2. *The A-ch'ang (Maingtha) Tribe of Hohsa-Lahsa, Yunnan.* *By* J. Coggin Brown, M.Sc.

These two papers will be published in a subsequent number of the *Journal.*

3. *Some Noxious Diptera from Galilee.* *By* E. Bruneiti. *Communicated by* Dr. N. Annandale.

4. *A Forgotten Kingdom of East Bengal.* *By* Nalini Kanta Bhattacharjee, M.A. *Communicated by* The Hon. Justice Sir Asutosh Mukhopadhyaya, Kt.

This paper will be published in a subsequent number of the *Journal.*

5. *Notes on Fishes, Batrachia and Reptiles of the Lake of Tiberias.* *By* N. Annandale, D.Sc., F.A.S.B.

The Adjourned Meeting of the Medical Section of the Society was held at the Society's Rooms on Wednesday, the 15th January, 1913, at 9-30 P.M.

Lieut.-Col. L. Rogers, C.I.E., I.M.S., in the chair.

The following members were present:—

Dr. Sivanath Bhattacharjee, Lieut.-Col. J. T. Calvert, I.M.S., Dr. Gopal Chandra Chatterjee, Dr. K. K. Chatterjee Dr. H. Finck, Col. C. R. M. Green, I.M.S., Major E. D. W. Grieg, I.M.S., Dr. W. C. Hossack, Dr. Indumadhab Mallick, Major E. A. R. Newman, I.M.S., Lt.-Col. F. O'Kenealy, I.M.S., Major J. F. A. Rait, I.M.S., Capt. J. D. Sandes, I.M.S.

Visitors:—Capt. Green-Armytage, I.M.S., Lieut.-Col. Burke, I.M.S., Dr. A. Gupta, Major A. Gwyther, I.M.S., Capt. R. B. Lloyd, I.M.S., Dr. G. C. Mitra, Col. W. B. Sutherland, I.M.S., and another.

The minutes of the last meeting were read and confirmed.

Dr. Chartterjee showed a large lipomatous tumour removed from the scrotum and a case of multiple fibromata.

Col. Sutherland read a paper on Anaphylaxis and pointed out its use in practical medicine.

Col. Green, Col. O'Kenealy, Major Rait, Lieut.-Col. Rogers, Dr. Hossack spoke, and Col. Sutherland replied.

FEBRUARY, 1913.

The Annual Meeting of the Society was held on Wednesday, the 5th February, 1913, at 9-15 P.M.

COLONEL G. F. A. HARRIS, C.S.I., M.D., F.R.C.P., I.M.S., President, in the chair.

The following members were present:—

Maulavi Abdul Wali, Dr. N. Annandale, Mr. J. Coggin Brown, Lieut.-Col. W. J. Buchanan, I.M.S., Babu Nilmani Chakravarti, Mr. B. L. Chaudhuri, Mr. F. Doxey, Mr. F. H. Gravely. Mr. H. G. Graves, Major E. D. W. Greig, I.M.S., Mr. A. H. Harley, Mr. D. Hooper, Rev. H. Hosten, S.J., Mr. W. Kirkpatrick, Mr. W. A. Lee, Rev. W. R. LeQuesne, Mr. D. McLean, Hon. Justice Sir Asutosh Mukhapadhyaya, Kt., Dr. Girindranath Mukerjee, Major E. A. R. Newman, I.M.S., Capt. C. L. Peart, Dr. G. E. Pilgrim, Mahamahopadhyaya Haraprasad Sastri, C.I.E., Mr. M. Kazim Shirazi, Mr. G. Stadler, Dr. Satis Chandra Vidyabhusana, Rev. A. W. Young.

Visitors.—Babu Hem Chandra Das-Gupta, Mr. P. Gangooly, Mrs. Newman and others.

The President ordered the distribution of the voting papers for the election of Officers and Members of Council for 1913, and appointed Messrs. R. D. Mehta and F. H. Gravely to be scrutineers.

The President also ordered the distribution of the voting papers for the election of Fellows of the Society, and appointed Messrs. R. D. Mehta and F. H. Gravely to be scrutineers.

The President announced that sixteen essays have been received in competition for the Elliott Prize for Scientific Research for the year 1912 which have been sent to the Director of Public Instruction, Bengal, one of the Trustees, for report, and that the result has not yet been received.

The President also announced that the Barclay Memorial Medal for the year 1913 has been offered to Major W. Glen Liston, M.D., C.I.E., I.M.S.

The Annual Report was then presented.

Annual Report for 1912.

The Council of the Asiatic Society has the honour to submit the following report on the state of the Society's affairs during the year ending 31st December, 1912.

Member List.

The number of Ordinary Members at the close of the year was 517. Forty-two Ordinary Members were elected during 1912. Out of these, 4 have not yet paid their entrance fees. The number of Ordinary Members, therefore, added to the list is 38. On the other hand 24 withdrew, 8 died and 8 were struck off under Rule 40.

The numbers of Ordinary Members in the past six years are as follows:—

Year.	Paying.				Non-Paying.				Grand Total.
	Resident.	Non-Resident.	Foreign.	Total.	Life.	Absent.	Special Non-Subscribing.	Total.	
1907 ..	174	175	20	369	20	30	1	51	420
1908 ..	181	193	17	391	19	38	..	57	448
1909 ..	183	217	13	413	20	40	..	60	473
1910 ..	209	217	16	442	23	43	..	66	508
1911 ..	200	225	19	444	22	53	..	75	519
1912 ..	203	229	19	451	23	43	..	66	517

The following members died during the course of the year:—Maharaja Sri Ram Chandra Bhunj Deb, Mr. W. H. Buchan, I.C.S., Babu Nobinchand Bural, Babu Mahendra Nath De, M.A., Raja Binoy Krishna Deb, Babu Girish Chandra Ghosh, Pandit Mohanlall Vishnulall Pandia, F.T.S. (Life Member), and Mr. E. L. Preston.

We have also to lament the death of one Honorary Fellow, viz., Lord Lister; the number is now 27.

The number of Special Honorary Centenary Members remains unchanged.

From the list of Associate Members, the name of Mr. F. Moore has been removed as he died some years ago. The number now stands at 13.

Two members, the Hon. Justice Sir Ashutosh Mukhopādhyāya, Kt., and Mahāmahopādhyāya Haraprasad Shastri, C.I.E., have compounded for their subscriptions during the year.

Indian Museum.

During the year there has been no change in the Society's Trusteeship and the Hon. Justice Sir Ashutosh Mukhopādhyāya, Kt., C.S.I., D.Sc., F.R.A.S., F.R.S.E., continues to be a member of the Board of Trustees of the Indian Museum on behalf of the Society under the Indian Museum Act X of 1910.

The Hon. Sir William Duke, K.C.I.E., presented to the Society fifteen sculptures from the grounds at Belvedere, and the Council has presented them to the Indian Museum for exhibition in the Archaeological Court in accordance with the provisions of the Indian Museum Act.

On a suggestion by the Director of the Geological Survey of India, the Council has agreed to the disposal of certain mineral specimens belonging to the Society, with other collections prepared for distribution to educational institutions, as loans from the Society.

Deputations.

Mr. G. H. Tipper, the General Secretary, represented the Society at the 250th Anniversary of the Royal Society of London held on the 16th July, 1912, and a Sanskrit address prepared by Mahāmahopādhyāya Haraprasad Shastri, C.I.E., was presented to them.

A Committee meeting to discuss arrangements for the formation of an Indian Association for the Advancement of Science, and for a preliminary Science Congress met in the Society's rooms on the 2nd Nov., 1912. Dr. W. A. K. Christie represented the Society.

Finance.

The accounts of the Society are shown in the Appendix under the usual heads. Statement No. XII contains the Balance Sheet of the Society and of the different funds administered through it.

The Credit Balance of the Society at the close of the year was Rs. 2,32,334-7-8 against Rs. 2,32,014-1-4 at the close of the preceding year.

The Budget for 1912 was estimated at the following figures :—

Receipts ..	..	Rs. 32,300
Expenditure ..	..	,, 28,188

The Budget estimate of receipts excludes "Admission Fees" and "Compounded Subscriptions."

The actual receipts of the year, exclusive of these items, have amounted to Rs. 32,521 or Rs. 221 in excess of the estimate; Rs. 1,184 have been received as admission fees and Rs. 200 as compounded subscriptions. The sum of Rs. 1,400 has been credited to the Permanent Reserve Fund, which now stands at Rs. 1,63,350. The receipts have exceeded the estimate under the heads of "Sale of Publications," "Rent of Room," and "Miscellaneous" by Rs. 610, Rs. 50, and Rs. 171, respectively. The "Sale of Publications" has been increased owing to demands for back numbers of the Society's publications by various libraries and individuals; "Rent of Room" has been increased on account of the collection of the rent for the month of December 1911 from the Automobile Association of Bengal; "Miscellaneous" is higher owing to the sum of Rs. 100 being voluntarily contributed to the Library Fund by Maulavi Shaikh Ahmed Husain Khan Bahadur of Partabgarh, and Rs. 90 being realized from Mr. B. N. De, the cost of a typed copy of the manuscript of Tajul Maasir damaged by him.

The receipts have fallen short of the estimate under the head of "Subscriptions for the Society's Journal and Proceedings and Memoirs," owing to non-payment of subscriptions.

In the Budget, the expenditure was estimated at Rs. 28,188, distributed under 17 heads. The actual expenditure has amounted to Rs. 29,209, or Rs. 1,021 more than the estimate. "Salaries" have been exceeded owing to increments granted to the Lama attached to the Tibetan Section and the typist. "Stationery" is higher on account of the purchase of duplicating paper, etc., for the Medical Section. "Fans and Light" have been increased owing to a complete change in the electric fittings. "Freights and Postages" have been increased owing to requisitions from the Society's Agencies and the despatch of publications of 1911 issued in 1912. The binding of a large number of Medical books and periodicals has caused an increase under this head. "Insurance" is higher owing to the purchase of a new Fire Policy for Rs. 1,25,000. The expenditure under other heads is not largely augmented.

There has also been an extraordinary expenditure of Rs. 1,930 for carrying out certain repairs to the Society's building which were urgently needed.

The Permanent Reserve Fund at the close of the year was Rs. 1,63,350 and the Temporary Reserve Fund at the close of the year Rs. 73,950, against Rs. 1,61,950 and Rs. 75,350 respectively, the figures of the previous year. The Trust Fund at the close of the year was Rs. 1,400.

The Budget estimate of Receipts and Expenditure for 1913 has been calculated at :—

Receipts	..	.. 32,010.
Expenditure	..	.. 31,469.

The Budget estimate of Receipts is about Rs. 1,895 less than the actuals of 1912. This is due to admission fees and compounded subscriptions.

The Budget estimate of Expenditure is about Rs 2,260 more than the actuals of 1912, owing to the provisions made to the following items, viz.: "Books" shows an increase of Rs. 1,418 as it is proposed to purchase more books for the Library. "Journal and Proceedings" and "Memoirs" are higher because certain printing charges of 1912 have not been paid yet; the other calculations are based upon the actuals of last year.

The expenditure on the Royal Society's Catalogue (including subscriptions remitted to the Central Bureau, London) has been Rs. 2,598-13-6, while the receipts under this head from subscriptions received on behalf of the Central Bureau have been Rs. 35-2. A sum of Rs. 2,206-5 has been remitted to the Central Bureau, London.

Mr. D. Hooper continued Honorary Treasurer throughout the year.

BUDGET ESTIMATE FOR 1913.

Receipts.

	1912. Estimate.	1912. Actuals.	1913. Estimate.
	Rs.	Rs.	Rs.
Members' Subscriptions ..	11,500	11,010	11,500
Subscriptions for the Society's "Journal and Proceedings" and "Memoirs"	1,608	1,560	1,608
Sale of Publications	2,000	2,610	2,000
Interest on Investments ..	8,392	8,320	8,392
Rent of Room	600	650	600
Government Allowances ..	3,000	3,000	3 000
Do. (for Researches in History, Religion, Ethnology and Folk-lore of Bengal) ..	3,600	3,600	3,600
Miscellaneous	100	271	100
Loan refunded	1,500	1,500	1,210
Admission fees	..	1,184	..
Compounded Subscriptions ..	..	200	..
Total ..	32,300	33,905	32,010

Expenditure.

Salaries	6,550	6,714	6,750
Commission	600	611	600
Pension	420	420	420
Carried over ..	7,570	7,745	7,770

	1912. Estimate.	1912. Actuals.	1913. Estimate.
	Rs.	Rs.	Rs.
Brought forward ..	7,570	7,745	7,770
Stationery	150	205	150
Light and Fans	260	1,071	260
Municipal Taxes	1,495	1,503	1,495
Postages	675	831	700
Freight	225	330	250
Contingencies	700	616	700
Books	1,200	1,182	2,600
Binding	1,000	1,405	1,000
"Journal and Proceedings" and "Memoirs"	10,600	9,831	12,000
Printing (circulars, etc.) ..	350	248	350
Auditors' fee	100	100	150
Petty Repairs	75	198	100
Insurance	188	344	344
Salary (for Researches in History, Religion, Ethnology and Folk-lore of Bengal)	3,600	3,600	3,600
Total ..	28,188	29,209	31,469

Extraordinary Expenditure.

Repairs .. .. .. Rs. 1,930

Agencies.

Mr. Bernard Quaritch and Mr. Otto Harrassowitz have continued as the Society's Agents in Europe.

The number of the copies of the *Journal and Proceedings* and of the *Memoirs* sent to Mr. Quaritch during the year 1912 was 147 valued at £24-18-6, and of the *Bibliotheca Indica* 389 valued at Rs. 466-8. Of these, copies to the value of £26-9-11 and Rs. 131-15 have been sold.

The number of the copies of the *Journal and Proceedings* and of the *Memoirs* sent to Mr. Harrassowitz during 1912 was 182 valued at £23-11-8, and of the *Bibliotheca Indica* 561 valued at Rs. 919-4. The sale-proceeds have been £28-3-9 and Rs. 803-13 respectively.

Library.

The total number of volumes and parts of magazines added to the Library during the year was 1932, of which 103 were purchased and 1829 were either presented or received in exchange.

On an application from Rev. H. Hosten, S.J., an Associate Member, the Council has agreed to lend him books from the Library in connection with his researches for the Society.

Khan Bahadur Shaikh Ahmed Husain, Taluqdar of Paryawan, Partabgarh, a member of the Society, offered Rs. 100 to the Library Fund; the Council has accepted with thanks his generous gift. With this money, a volume of Turki MSS. consisting of a collection of fifteen Turkish works by the celebrated Mir Ali Shir was purchased for the Library.

A copy of the Kanārak Album containing about 250 bromide photographs, price Rs. 300, was also purchased for the Library.

It has been proposed to prepare a catalogue of the serial publications dealing with Natural Sciences that are available in Calcutta, and a small Sub-committee has been formed to work out the scheme. Various libraries and institutions possessing scientific periodicals have been asked to co-operate, and there will be a meeting of the Sub-committee shortly to consider the matter further.

In addition to Rs. 600 granted to the Rev. H. Hosten, S.J., during 1911, the Council has sanctioned a further sum of Rs. 400 towards obtaining photographic facsimiles of historical documents referring to the Mogul Empire, Tibet, Bengal and Pegu (Burma).

Mr. J. H. Elliott has continued as Assistant Secretary throughout the year.

Pandit Balai Lal Dutt, B.A., has been appointed pandit of the Society in the place of Pandit Nava Kumar Lahiri, B.A., and Babu Ramesh Chandra Chatterji has been confirmed in the post of typist.

The Council has decided to dispense with the services of Munshi Ahmad Hosain from the 31st January, and to appoint an English-speaking Maulavi on Rs. 50 per mensem, in his place.

International Catalogue of Scientific Literature.

Messrs. I. H. Burkill and F. H. Gravely acted as joint secretaries of the Regional Bureau until Mr. Burkill's retirement from India, when the Natural History Secretary took over his work.

The Bureau suffered in efficiency during the year by the recurring illness of the clerk in charge, and only 387 index slips were despatched. Arrangements have now been made, however, for expediting the work.

Two hundred and seventy-six volumes were distributed and £147-7-6 was remitted to the Central Bureau. The cost of upkeep was Rs. 392-8-6.

The Council, in reply to a letter from the Director of the International Catalogue, enquiring if the Society would approve of the indexing of scientific literature published in Ceylon being taken over by a Regional Bureau for Ceylon, if established, intimated its assent.

The following periodicals are indexed by the Bureau. Authors publishing elsewhere are asked to submit reprints in order to call attention to their work:—

Societies.

1. Journal of the Asiatic Society of Bengal.
2. Memoirs of the Asiatic Society of Bengal.
3. Journal of the Bombay Natural History Society.
4. ,, ,, ,, Astronomical Society of India.

Official Publications.

Meteorology.

5. Annual Summary of the Indian Weather Review.
6. Indian Meteorological Memoirs, Calcutta.

Chemistry.

7. Memoirs of the Department of Agriculture in India, Chemical Series.

Botany.

8. Records of the Botanical Survey of India.
9. Annals of the Royal Botanical Gardens, Calcutta.
10. Annals of the Royal Botanic Gardens, Peradeniya.
11. Memoirs of the Department of Agriculture in India, Botanical Series.

Zoology, Animal Physiology and Bacteriology.

12. Records of the Indian Museum.
13. Memoirs of the Indian Museum.
14. Indian Civil Veterinary Department Memoirs.
15. Memoirs of the Department of Agriculture in India, Entomological Series.
16. Indian Medical Gazette.
17. Journal of Tropical Veterinary Science.
18. Paludism.

Geology.

19. Memoirs of the Geological Survey in India.
20. Records, Geological Survey of India.
21. Palaeontologia Indica, Geological Survey of India.

Mixed.

22. Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India.
23. Indian Forest Records.

Fellows of the Society.

On the recommendation of the Fellows, the Council resolved that in future the names of the proposers be printed in each case on the list of members proposed for Fellowship.

At the Annual Meeting held on 7th February, 1912, Mr. H. Beveridge, I.C.S. (retd)., Mr. J. C. Bose, C.S.I., C.I.E., M.A., D.Sc., Prof. P. J. Brühl, F.C.S., Capt. S. R. Christophers, I.M.S., and Mr.. C. S. Middlemiss, B.A., F.G.S., were elected Fellows of the Society.

Elliott Prize for Scientific Research.

Twelve essays were received in competition during 1911 and two were awarded Prizes: viz. one on the "Preparation of Potassium Carbonate and Potassium Bicarbonate on a large scale from Nitre," by Babu Jitendra Nath Rakshit, and the other on "A few new Ketonic Dyes," by Jatindra Mohan Datta.

The Trustees have again sanctioned the award of four Prizes for the year 1912 for original work or investigations by the essayist, in Physical, Chemical, Mathematical and Natural Sciences. This notification was printed in the *Calcutta Gazette* of the 3rd July, 1912. Sixteen essays have been received in competition, and have been referred to the Trustees for report.

Barclay Memorial Medal.

In connection with the award of the Barclay Memorial Medal for 1913, the following members were appointed to form a "Special Committee" to record their recommendations for the consideration of Council: Dr. W. A. K. Christie, B.Sc., Major A. T. Gage, I.M.S., Dr. G. E. Pilgrim, F.C.S., Capt. D. McCay, I.M.S., Mr. F. H. Gravely, M.Sc.

Society's Premises and Property.

The Hungarian Academy of Sciences has presented the Society with a bronze bust of Alexander Csoma de Körös. The President unveiled the bust at the Monthly General Meeting on the 3rd April 1912, and it is placed in the rooms of the Society to perpetuate his memory.

There is another addition to the list of the portraits in the rooms of the Society. At the request of the Committee of the Sir Thomas Holland Memorial Fund, the Council has accepted a portrait of Sir Thomas Holland, K.C.I.E., A.R.C.S., D.Sc., F.R.S., F.A.S.B., for safe keeping. The portrait, which is by the Hon. John Collier, was obtained by public subscription and has been hung in the Society's rooms.

The Monthly General Meeting table has been repaired at a

cost of Rs. 168. It is now in ten separate pieces, and can be removed easily for lectures and other public meetings.

There was a serious outbreak of fire at the main entrance of the Society's premises caused by the fusion of the main wires of the Electric Supply, but fortunately no damage resulted. The electric fittings have been completely changed by Messrs. Kilburn & Co. at a cost of Rs. 590, and the electric meter board is now placed under the portico instead of at the main entrance of the Society's premises.

The Society held two Fire Policies, one for Rs. 2,50,000 and other for Rs. 25,000 on the Society's buildings and their contents in the Lancashire Insurance Company. As this sum did not sufficiently cover the property the Council has now increased the amount by Rs. 1,25,000. The new Policy has been issued in favour of the Society by the Alliance Assurance Company, Limited, and the three policies have been deposited in the Bank of Bengal for safe custody.

It was found necessary to carry out certain repairs to the Society's building and a sum of Rs. 1,930 was spent on work which was urgently needed.

The building of the new premises for the Society has not yet been taken in hand. There have been several meetings of the members of the Building Sub-Committee, and the Secretary is now engaged in preparing final details with regard to valuation, etc., for submission to the Committee. The names of the Philological Secretary, Natural History Secretary and the Anthropological Secretary have been added to the Building Sub-Committee. Permission has been granted to the Corporation of Calcutta to acquire the strip of land belonging to the Society for widening Park Street as soon as they require it.

Exchange of Publications.

During 1912, the Council accepted two applications for exchange of publications: viz. (1) from the Tohaku Imperial University, Sendai, Japan, the Society's *Journal*, *Proceedings* and *Memoirs* in exchange for the University's Science Reports; and (2) from the Bureau of Productive Industry, Government of Formosa, the Society's *Journal*, *Proceedings* and *Memoirs* in exchange for all publications of the Bureau.

An exchange of publications with the Editor of the *Journal of Tropical Veterinary Science* has been stopped owing to the discontinuance of the *Journal* by the Government of India.

Publications.

There were published during the year twelve numbers of *Journal and Proceedings* (Vol. LXXV, Parts 1-2; Vol. VII, No. 8-11; and Vol. VIII, Nos. 1-8) containing 1102 pages and 30 plates.

Of *Memoirs* only one number was published (Vol. III, No. 5) containing 82 pages.

Numismatic Supplements Nos. 16-18 have been published in the *Journal and Proceedings*, Vol. VII, No. 10, and Vol. VIII, Nos. 3 and 5–6, under the editorship of Mr. H. Nelson Wright. Of the Numismatic Supplement 200 extra copies have been printed; 70 copies are subscribed for by the Numismatic Society of India and 30 copies are sent to the Numismatic Secretary for distribution; the remaining 100 copies are for sale.

A second list of Arabic and Persian MSS. acquired on behalf of the Government of India by the Asiatic Society of Bengal during 1908-1910 has also been published, and copies are supplied to members on application.

Mr. G. H. Tipper held the post of General Secretary and editor of the *Proceedings* until the middle of June when he left for Europe and Mr. S. W. Kemp was appointed to officiate for him until his return. Dr. E. D. Ross left for Europe in the middle of March and Lieut.-Col. D. C. Phillott was appointed to carry on the work of the Philological Secretary and editor of the Philological Section of the *Journal* during his absence. Lieut.-Col. Phillott officiated until May when he retired from India and Captain C. L. Peart was appointed to succeed him. Mr. I. H. Burkill carried on the duties of Natural History Secretary and editor of the Natural History Section of the *Journal* up to March, when he left for Europe and Dr. W. A K. Christie was appointed to act for him. In October, Mr. Burkill resigned his office, and Dr. Christie was permanently appointed. Dr. N. Annandale was Anthropological Secretary and editor of the Anthropological Section of the *Journal* until May, when he left for Europe and Captain R. B. Seymour Sewell, I.M.S., was appointed to act for him. Dr. Annandale returned in November and took over charge from Captain Sewell. Dr. Satis Chandra Vidyābhūṣaṇa carried on the duties of the Joint Philological Secretary and was in charge of the *Bibliotheca Indica*, while Mahāmahopādhyāya Haraprasād Shāstri, C.I.E., continued as Officer-in-charge of the Search for Bardic Chronicles and the work of collecting Sanskrit Manuscripts throughout the year. Dr. Ross was also in charge of the Search for Arabic and Persian Manuscripts until his departure from India, when Mr. Tipper carried on the current duties of the search. On Mr. Tipper leaving for Europe, Captain Peart was appointed Officer-in-charge of the Arabic and Persian Search. Captain J. D. Sandes continued as Medical Secretary throughout the year. The Coin Cabinet was in charge of Mr. H. Nelson Wright who has reported on all Treasure Trove coins sent to the Society.

Lectures.

During the year, the following four lectures were delivered in the Society's rooms: 1. On Recent Advances in our

Knowledge of the Freshwater Fauna of India, with lantern slides by Dr. N. Annandale, C.M.Z.S., F.A.S.B., on the 27th March. 2. Notes of a Botanist in the Abor Hills, with lantern slides, by Mr. I. H. Burkill, M.A., F.L.S., F.A.S.B., on the 12th April. 3. On Engravings, illustrated by numerous lantern slides showing the history of the art from 1770 to 1870, by W. H. Phelps, two lectures on the 8th and 9th July. 4. On the Sea of Galilee and its Fauna, with lantern slides, by Dr. N. Annandale, C.M.Z.S., F.A.S.B., on the 13th December, 1912.

Philology, etc.

In the March number Father Hosten throws some new light on the Aśoka Pillars near Bettiah by translating an extract from the writings of Padre Marco della Tomba; and Maulavi Abdul Wali makes an interesting contribution to the early history of the English in Bengal. In this article the author, from a study of the Persian chronicles of the time, disposes of the oft-quoted story that it was owing to Boughton having cured a princess of the Moghul court that the English obtained the privilege of trading in Bengal duty free.

The *Journal* for April contains a translation from the Persian of the autobiography of a learned Muhammadan cleric of Delhi, who flourished some 200 years ago, named Shah Waliullah. This translation is by Maulvi Hidayat Hussain of the Presidency College, Calcutta, is copiously annotated, and contains a notice of 17 of Shah Waliullah's works, mostly theological. The reputation of this traditionist may be judged from the number of Hindustani translations existing of his works. He appears to have been a precocious child, as he tells us that, by the end of his seventh year, as far as he can remember, he had finished reading the Quran. The publication of the Persian text of this autobiography is justified by the convenience it affords of having it alongside its English translation, if not by the difficulty that Europeans have in deciphering the usual bazaar lithographed editions.

This number also contains various anecdotes concerning the Pitt diamond collected by Father Hosten.

The May and June number contains a particularly interesting contribution by the same writer to the already large and steadily growing literature that deals with Akbar and his times. The article in question is a translation of a Relation by Fr. Monserrate, S.J. It appeals through the minute personal details given of 'Equebar' (Akbar), by one who was in constant touch with him for about a year, as tutor to his son. The Relation was utilized by the Jesuti historians, but it appears now for the first time in the original Portuguese with an annonated English translation.

Father Hosten continues his contributions to the folklore of

India in the July and August number. His note on the tradition that subterranean passages exist, connecting Delhi with several places in its vicinity, has a topical interest; while in his article on the "Mouthless Indians of Megasthenes," he advances an ingenious theory as to how a historian and an ambassador came to report the existence of a people who lived on the smell of fruits, and having therefore no use for mouths, presumably had none. A hundred modern Arabic Proverbs collected by Captain Murphy of the 30th Punjabis, during a six months' stay in Damascus, should prove very useful to the increasingly large number of officers, and others who are now interested in modern Arabic. The same *Journal*—viz. that of August—contains a poem in Persian by the Emperor Shah Alam II. Side by side is a translation by Maulavi Hidayat Hussain.

The December number is remarkable for a very beautiful and ingenious quatrain by the late Mr. Azoo. It is in Arabic and has for its subject the accession of H. M. King George V. It is at once chronogrammatic and eulogistic. A very lucid note, explaining the beauties of the composition, has been written on the quatrain by Dr. Suhrawardy.

The "Vyavahāramātṛkā of Jīmūtavāhana" forms the subject of a Memoir by the Hon'ble Justice Sir Ashutosh Mukhopādyāya. Kt., C.S.I. This most important Sanskrit work on Jurisprudence was hitherto unknown to our jurists. It contains among other matters an elaborate discussion on the law of evidence, and throws much new light on such disputed questions as the acquisition of title by prescription, adoption of an only son, etc. Babu Braja Lal Mukerji in a paper on "The date of Varāha Mihira" supposes that Varāha Mihira chose the Saka year 427 (A.D. 505) as the starting point of his astronomical calculations very probably to commemorate the date of his own birth. "Who were the Suṅgas?" is the title of a paper in which Mahāmahopādhyāya Haraprasad Shastri maintains that the Suṅgas, who under their leader Puṣpa Mitra persecuted the Buddhists and overthrew the Maurya empire, were not of Persian origin as was previously supposed, but that they were Brāhmans of the Sāmavedic school, accustomed to perform horse-sacrifices. Mahāmahopādhyāya Shastri in a note on 'Bhaṭṭi" quotes a passage from a palm-leaf manuscript to show that the poet Bhaṭṭi was the son of Śrīdhara Svāmī of Valabhī. Babu Surendra Nath Mazumdar Shastri in a note on "Cavalry in the Rigvedic age" quotes passages from the Rigveda to prove that the horse was used for riding in the Vedic age. In a note on Bhatti Kāvya the same writer tries to prove that poet Bhaṭṭi was no other person than Brāhmaṇa Bhaṭṭi Bhaṭa to whom Dhruvasena III of Valabhī granted a village in A.D. 653.

Mr. Kingsmill, Vice-President of the China Branch of the

Royal Asiatic Society, has contributed a paper to the *Journal* throwing a good deal of new light, from Chinese sources, on some important questions connected with the era of Vikramāditya and foundation of the Kushan Kingdom in India. It is stated that the word "Kyniska," or "Kaniska," is not a proper name, but that it simply means a king, and that the real founder of the Kushan dynasty was Kadiphes who was surnamed "Kṣatraoṇam Kṣatra Kyniṣka Koṣano," hero of heroes, King of Kushanas. Kadiphes who took possesion of the Punjab and Western Magadha in 57 B.C. is supposed to have been identical with King Vikramāditya of Hindu tradition.

Dr. E. D. Ross reprints in a special number of the *Journal*, entitled Tibetan studies, fourteen articles by Alexander Csoma de Körös. These articles which were contributed to the *Journal* by Csoma during the years 1832-1840 are of permanent value to Tibetan scholars. They lay scattered over eight different volumes until they were carefully collected together in one special number by Dr. Ross.

A paper by Lama Dawa Somdup contains the English translation of Gejor Dumpa's prayer which gives a picture of the highest Buddhist ideals prevailing among the Tibetans.

Mr. F. E. Pargiter contributes an important paper on epigraphy. The Ghāgrāhāṭi grant which forms the subject of his paper relates to the grant of a piece of waste land to a Brāhmaṇa in Mauzā Ghāgrāhāṭi in the district of Faridpur during the reign of Samācāradeva in the seventh century A.D. It is observed that the grant is not spurious or forged as was previously supposed, and that there is nothing ambiguous or unintelligible in it. Paṇdit Mohanlall Vishnulall Pandia makes a critical examination of the transcript of Atapura Inscription which is dated A.D. 968, and contains the names of Prince Śakti-Kumāra of Mewar and fourteen of his ancestors. The writer discusses the merits of two rival theories, viz. the Vallabhī theory upholding the Sūryavaṁsa origin of the Guhilot Kings of Mewar, and the Ānandapura theory advocating that the chiefs of Mewar were originally Nāgara Brāhmaṇas. In giving an account of the Belkhara Inscription and the Machli-Sahara grant. Babu Rakhal Das Banerji states that the inscription set upon a stone-pillar at Belkhara in the Mirzapore district in the year A.D. 1197 and the grant dated the Vikrama year 1257, prove that King Hariśa Candra, son of Jaya Candra, reigned in Oudh full seven years after his father's death in the battle of Chandawar. An account of the Dinajpur Pillar Inscription was published some years ago in the *Indian Antiquary*, and formed the subject of much interesting discussion at the time. It records the erection of a temple of Siva by a King of Gauda belonging to a Kāmboja family. Mr. Ramā Prasād Chanda has reviewed the subject and contributed a paper to our *Journal* in which he supposes that the Kāmbojas

were Koch Rājvamsis, and that the inscription was prepared at the end of the tenth century A.D. An image of Buddha and another of Bodhisattva Lokanātha discovered at Mahibhinta in the district of Māldāh form the subject of a paper called "Two Buddhist Stone images from Māldāh," by Babu Akṣaya Kumāra Maitra. The image of Buddha seated on Vajrāsana and attended by Lokeśvara and Maitreya will prove to be of considerable interest to the students of Buddhist iconography, while the image of Lokanātha adorned with a crown of clotted hair and seated on a lotus-throne will be appreciated as a rare find in Bengal.

Pandit Rāmānuj Svāmi in his article on "Simhachelam Temple" gives some account of a famous Vaiṣṇava temple near Vizagapatam containing an image identified by some with Narasimha, by others with Varāha. The writer does not place much reliance on the theory that the temple was originally a Saivite one, and was afterwards converted into a Vaiṣṇava temple by Rāmānuj in the twelfth century A.D. Rai Bahadur B. A. Gupte contributes a note on "Somavati Vrata" which is a Hindu ceremony celebrated by women on dark Mondays.

Natural History, etc.

Fourteen scientific papers were issued, all in the *Journal*, in the year under review, six botanical, five chemical, three zoological and one physical.

Botany.

Two further instalments of that monumental work, "Materials for a Flora of the Malayan Peninsula," both by J. S. Gamble, C.I.E, F.R.S., have been issued, and form Parts 1 and 2 of Vol. LXXV of the old series of the *Journal* The other botanical papers are:—

New and Revised Species of Gramineae *from Bombay*, and *two more species of* Gramineae *from Bombay*—*By* K. Bhide, *Assistant Economic Botanist, Bombay.*

Corchorus capsularis *var.* oocàrpus—*a new variety of the common jute plant*—*By* I. H. Burkill *and* R. S Finlow.

Polarity of the Bulbils of Dioscorea bulbifera *Linn.*—*By* I. H. Burkill.

Zoology.

Some Recent Advances in our Knowledge of the Freshwater Fauna of India.—*By* N. Annandale, D.Sc., F.A.S.B.

Freshwater Sting-Rays of the Ganges.—*By* B. L. Chaudhuri, B.A., B.Sc.

Contribution to our Knowledge of Indian Earwigs.—*By* Malcolm Burr, D.Sc., M.A., F.E.S.

CHEMISTRY.

Allylammonium Nitrite.—*By* PRAFULLA CHANDRA RAY *and* RASIK LAL DATTA.

On Isomeric Allylamines.—*By* PRAFULLA CHANDRA RAY *and* RASIK LAL DATTA. (*Preliminary Communication*).

Preliminary note on Sodium diacetamide $\begin{matrix} CH_3.CO \\ CH_3.CO \end{matrix} > N.\ Na.$—*By* JITENDRA NATH RAKSHIT.

Piperazinium Nitrite.—*By* PRAFULLA CHANDRA RAY *and* JITENDRA NATH RAKSHIT. (*Preliminary Communication*).

A possible chemical method of distinguishing between seasoned and unseasoned Teak-wood.—*By* ANUKUL CHANDRA SIRCAR, M.A., F.C.S.

PHYSICS.

Note on the Secular Cooling of the Earth and a Problem in Conduction of Heat.—*By* D. N. MALLIK.

Notes were also read on "Further Spreading of *Croton sparsiflorus* (Moruna)," by I. H. Burkill, "A measure of Chemical Affinity," by M. N. Banerji, and "The Classification, Habits and Nidification of the Ravens of India," by P. T. L. Dodsworth.

Exhibits were made of Swedish minerals, by L. L. Fermor, of *Poecilocoris latus*, Dall, an insect pest of tea, by G. D. Hope, of a Freshwater Medusa from the Western Ghats, probably identical with *Limnocnida tanganyicae*, by N. Annandale, and of living Pedipalpi, by F. H. Gravely, who contributed a note for the *Proceedings* on the distribution of the order.

Anthropology and Allied Sciences.

Much of the work published by the Society as "Philology," a term to which a wider significance is given in India than elsewhere, has a certain anthropological interest and, conversely, much issued under the heading "Anthropology" is mainly philological in the strict sense of the term. The chief difficulty that besets the Anthropological Section is the fact that there are no professional students of anthropology in the country, and that those branches of the science which call for the most scientific methods of inquiry are therefore almost entirely neglected. Consequently, it is often forgotten that anthropology is a science at all, and it becomes difficult to restrain the superficial observer from putting on permanent record observations that would prove of the greatest possible hindrance to future investigation of forgotten customs or vanished races. In the *Journal* for 1912, five short papers

that may be claimed as anthropological have been published, and two longer papers (one on the manufacture and distribution of chank-shell ornaments, the other on Pushtu folk-tales) are now in the press for the *Memoirs*. It cannot therefore be claimed that anything of a comprehensive nature or of special scientific interest has been published or will be issued immediately. Our efforts have been exercised rather as a restraining influence than in encouraging the production of premature results. Next year, however, we may look forward to the publication of an important work now actually in hand, namely the anthropological investigations of Sir George Duff-Dunbar, and Messrs. S. W. Kemp and J. Coggin Brown undertaken on the North-East Frontier of the Indian Empire, in part at least as a result of the Abor Expedition of 1911–1912.

Medical Section.

Monthly meetings have been held regularly throughout the year and there has been a fair average attendance. Several important papers were read and interesting discussions took place. Major Rogers was, as usual, the largest contributor and continued to supply regularly further interesting Gleanings from the Calcutta Post-mortem Records. He also gave a lecture on his experiences in Palermo during the cholera epidemic. Dr. W. C. Hossack read a paper on Plague and initiated a discussion on Dengue fever. A paper on Malaria by Dr. Bently created much interest, and Dr. Adrian Caddy gave us his experience in Life Insurance in India. Other papers in Tuberculin Treatment, Some new Anopheles of Calcutta, Morbidity of lying-in cases in Calcutta and Nervous Diseases were read. Clinical cases were shown at most of the meetings. References to the most important articles in the *Medical Journal* have been regularly circulated to members. Captain J. D. Sandes, I.M.S., continued to act as Medical Secretary throughout the year. Lt.-Col. Drury, on transfer to Behar, resigned his position as Vice-President and was succeeded by Major Rogers.

Bibliotheca Indica.

Of the 42 fasciculi of texts of different dimensions published in the *Bibliotheca Indica* series during the year under review, 27 belong to Brahmanic Sanskrit, 1 to Jaina Prākṛta, 2 to Buddist Sanskrit, 2 to Tibetan, 3 to Sanskrit and Tibetan and the remaining 7 to Arabic and Persian literature. These fasciculi include Mr. Beveridge's translation of Ākbarnāmā (vol. III, fasc. III); Mahāmahopādhyāya Dr. Gaṅgā Nath Jhā's translation of Tantravārtika (fasc. XI); and Mahāmahopādhyāya Dr. Satīs Chandra Vidyābhūṣaṇa's edition of the Sanskrit-Tibetan Amarkoṣa (fasc. II). This fasciculus of Amarakoṣa completes the work. When the bilingual index is

prepared, it will be a reliable Tibetan-Sanskrit dictionary of great historical weight.

Of the new works sanctioned last year, 10 fasciculi have been published this year, viz. :—

1. *Amaraṭīkā-kāmadhenu*, the Tibetan version of a comprehensive Buddhist-Sanskrit commentary on the Amarakoṣa, edited by Mahāmahopādhyāya Dr. Satīs Chandra Vidyābhūṣaṇa. The original commentary was prepared by a Buddhist sage named Subhūti Candra, whose age is unknown, while the Tibetan version was made by an Indian Paṇḍita named Kīrtti Candra with the assistance of a Tibetan scholar named Grags-pa-rgyal-mtshan in the town of Jambu in Nepal in the ninth century A.D.
2. *T'i-med-kun-den*, the Tibetan version of a Jātaka story, edited by Dr. E. D. Ross.
3. *Sadukti-Karṇāmṛta*, edited by Professor Rāmāvatāra Śarmā. The work contains a large number of melodious Sanskrit verses collected by Poet Srīdhara Dāsa during the reign of Lakṣaṇa Sena in the twelfth century A.D.
4. *Bhāṣā-Vṛtti*, a Sanskrit commentary on Pāṇini's grammar, by Puruṣottama Deva with a gloss by Sṛṣṭidharācārya, edited by Paṇḍit Girīs Chandra Vedāntatīrtha.
5. *Smṛtiprakāśa*, a Sanskrit work on the Utkala school of Smṛti, by Vāsudeva Ratha, edited by Mahāmahopādhyāya Sadāśiva Miśra.
6. *Sūrisarvasva*, a Sanskrit work on Utkala Smṛti, by Govinda Kavibhūṣaṇa Sāmantarāya, edited by Paṇḍit Jagannāth Miśra.
7. *Gulriz*, a Persian fairy tale by Ziā'u'd-Dīn Nakhshabī of Badaun who died in 1350 A.D., edited by Agha Muhammad Kazi Shirazi and the late Mr. A. F. Azoo.
8. ***Memoirs of Shāh Tahmāsp***, a Persian work, edited by Lt.-Col. D. C. Phillott, Ph.D.
9. ***Shāh-'Ālam Nāma***, a biography of Shāh-Ālam, edited by the late Hari Nath De.
10. ***Amal-i-Ṣāliḥ*** or Shāh Jahān Nāmāh, by Muhammad Ṣāhliḥ Kambu, edited by Mr. G. Yazdani.
11. *Kashf al-Ḥujubwal Astār 'an asmā' al-Kutubwal Asfār*, or The Bibliography of Shī'a Literature of Mawlānā I'jāz Ḥusain al-Kantūrī, edited by Maulavi M. Hidayat Husain.

Search for Sanskrit Manuscripts.

Though engaged in the arduous task of cataloguing 1600 manuscripts during the year, the Shāstri found time to make

a small but very important collection of manuscripts, mostly on palm-leaf and very ancient.

The first and most important of these is Smṛtimañjarī by Govindarāja, the son of Mādhava Bhaṭṭa. Govindarāja is well known as a commentator of Manu. The standard commentary on Manu by Kulluka Bhaṭṭa of the fifteenth century A.D. draws most of its materials from Govindarāja; yet it condemns him in no measured terms. Professor Jolly thinks that Govindaraja stands between the eleventh and the fifteenth centuries, and that he might be identified with Govindacandra, the king of Kanouj. The present manuscript was copied in old Newari character and in the year A.D. 1145. This piece of information given in the manuscript itself goes directly against Professor Jolly's chronological theory about the work. The author's father was Mādhava Bhaṭṭa, while the father of the king Govindachandra was Madanapāla. So the commentator of Manu was not the same person as the king of Kanouj.

Smṛtimañjarī treats of Ācāra and Prāyaścitta, and is the oldest compilation of Smṛti yet discovered.

Along with the manuscript of Smṛtimañjarī came the manuscript of Parāśara Smṛti, written by the same hand, but three years earlier.

The third palm-leaf manuscript acquired during the year is in transitional Gupta character. The handwriting agrees with that of the manuscript of Laṅkāvatāra in the Durbar Library of Nepal, the last page of which has been photographed in the Shāstri's Nepal Catalogue of 1905. The said manuscript of Laṅkāvatāra is dated A.D. 908. The present manuscript contains a later Buddhist work, probably of the Sahajiyā School. The work is entitled Paramādya Mahākalparāja and treats at some length of *Mudrās*, rituals, *mantras* and so on. But unfortunately the manuscript is not complete. It contains more than 150 leaves, but the total is unknown.

Ratnaparīkṣā by Buddha Bhaṭṭācārya is a curious work on the testing of precious stones. The manuscript is not complete. Gaṅgālaharī is a well-known hymn to River Ganges by Jagannāth Paṇḍitarāja, the court paṇḍit of Daraseko, the unfortunate, eldest son of Emperor Shah Jehan. A commentary on it by Dalapatirāma, the eldest son of Durgārāmāsūri, has been acquired in the year under review. Prayogamukha is a useful work on Sanskrit Grammar in five chapters, treating of *Kāraka*, *Samāsa*, *Taddhita*, *Kṛt* and *Tip*. Sekoddeśaṭippanī is a commentary on a very rare Tantrik work of the Buddhists. Sādhana Samuccaya is a book on the iconography of the Buddhists. But unfortunately the manuscript is not complete. Vīravīradavali by Maithila Raghudevamiśra is an interesting work, having for its subject the heroic achievements of Varavīrasahi, a local chief of Nepal. The Hevajrapañjikā is a commentary on the Hevajratantra, a very rare work of the

Vajrayana School of the Buddhists. The commentary is written by a very great man, Kṛṣṇācāryya or Kāhnapāda, one of the founders of the Sahajīyā School. A mutilated copy of the commentary in Bengali Law of 1198 is to be found in Cambridge.

Coins.

One gold, eleven silver, four billon and one copper coins were presented to the Cabinet during 1911. Of these the only one of more than ordinary interest was the gold coin presented by the Central Provinces Government, of which the origin is uncertain. The obverse contains four punched areas in one of which are the words "Śri Jagadeva." The coin may have been struck by a Jagadeva who reigned in South India about the 12th century (cf. Elliot's Coins of Southern India). The reverse of the coin is blank.

Of the others, two were Gadhiya coins, two (billon) of the Pathan series, six Mughal, one Durrani, one of Nādir Shāh, one (copper) of the Gujarāt Sultanat, three of Native States.

Eleven coins were presented by the Bombay Branch of the Royal Asiatic Society, three by the Central Provinces Government, two by the Commissioner of Ajmere and two by the Agent to the Governor-General in Central India.

The Numismatic Secretary examined twelve finds consisting of 300 coins during the year for the Central Provinces and Punjab Government. None of these finds contained any coin of unusual interest.

Search for Arabic and Persian MSS.

During the year, no MSS. were purchased on behalf of Government, owing to want of funds. The principal item of expenditure that has been incurred is the salaries of the two Maulavies attached to the Search. In order to curtail expenses, the Council dispensed with the services of Maulavi Qasim Hasir, the second travelling Maulavi, with effect from 10th December 1912. It is proposed to spend the money thus saved, not so much in purchasing MSS., but in preparing lists of where valuable manuscripts are to be found Of manuscripts we can expect to be able to purchase only a few, whereas it should be possible to ascertain the existence and whereabouts of a comparatively large number. Maulavi Hafiz Nazir Ahmad, the first travelling Maulavi, is now on tour, visiting Hyderabad and Madras for this purpose, and it is proposed to publish eventually lists of the whereabouts of such important MSS. as the Society have so far discovered.

In compliance with a request made by the Librarian of the Imperial Library, Maulavi Qasim Hasir was allowed to assist in the preparation of a Catalogue raisonné of the books

of the Bohar library, on which work he was engaged from 6th May to 28th November 1912.

Bardic Chronicles.

Mahāmahopādhyāya Haraprasād Shāstri, M.A., C.I.E., made his third tour this year in search of Bardic Chronicles. At Bharatpur, he examined a large collection of Sanskrit and Bardic manuscripts in the State Library. The best Bardic work is Sujan Carit of the life of Surajmal, the founder of the Jat greatness in the Subah of Agra. The author's name is Sudhan Kavi. The other Bardic works generally contain descriptions of marriages of princes, border feuds with Alwar and Karauli, and the transactions of the Bharatpur State with the British Government.

At Bundi, too, the Shastri examined the Raj Library, containing about 2,000 manuscripts both Sanskrit and Bardic. The Bardic works treat generally of the Hāḍā Rajput family of Bundi. The principal work is Vaṃśabhāskara written about 70 years ago by Vārhāṭ Sūrajmall of Bundi. He was a good poet, a good historian and a voluminous writer. He was ably aided by the then reigning prince of Bundi, who collected for him all the available materials for his history, the history of Hāḍā Cauhāns. The author deals with all the Rajput principalities that came in contact with the Bundi State. The work Vaṃśa Bhāskara was designed to be completed in 12 Rāśis or signs of Zodiac. But the author died after the completion of the tenth. It has now been published with a commentary by Kṛṣṇa Singha at Jodhpur. Several works on the same subject have been written, based on the Vaṃsa Bhāskara: (1) Vaṃśa Prakāśa by Paṇḍit Gaṅgā Sahāya: (2) Vaṃsapradīpaka by Gvarsiram Miśra; (3) Vaṃśa-vinoda by Jagaṃnāth Miśra. There is in the library a Sanskrit work entitled Śatruśālya-carita by Viśvanātha Paṇḍit written in the beginning of the eighteenth century. It gives the history of Rāo Rājā Śatru Śalya who played an important part in the history of the later Moghals. The book has a commentary by Paṇḍit Gaṅgā Sahāya, the late Prime Minister of the State, who was himself a voluminous writer both in Sanskrit and in Hindi. The library contains many important Bardic works including:—

(1) Vaṃśa-Kallola by Dayārām.
(2) Yaśaḥprakāśa by Rāo Kokṣaṣṭi.
(3) Śatru Śalya Rāsau by Rāo Vagri Dungar Singh.
(4) Vaṃśāvali of the Hāḍās.
(5) Vaṃśābharaṇa by Misan Caṇḍidān.
(6) Hambīra Rāsau by Maheśa Kavi.
(7) Rāṇāsuyaśaścandrikā by Muṇḍan Kavi.
(8) Vaṃśāvalivārtika by Dayārām Paṇḍit.
(9) Viṣṇu Singha Carita by Dayārām Paṇḍit.
10) Ummeda Singha Carita by the same.

At Ujjain the Bhāts sometimes come. But Bardic works are not much encouraged. There are, however, Jagāis who keep the genealogies of all the inhabitants; and these genealogies are very ancient and they are taken as evidence in the Civil Courts in the Native States. Ujjain is a very ancient city and its exploration by competent scholars is likely to lead to important results. The city stands on the eastern bank of the Śiprā. The ancient town was to the north of the modern city. The site of the ancient city is now a heap of ruins, rising from 10 to 30 feet above the level of the surrounding country. The site of the modern city was anciently occupied by the temple of Mahākāla, the palace of the king, his offices, and the gardens belonging to the temple and the palace. Kālidāsa speaks of the royal gardens being on the Śiprā and the temple gardens on the Gandhavatī; the latter was a considerable stream in the poet's time and fashionable women delighted to bathe in it. But the stream does not exist at the present moment and it was only after a good deal of search and investigation that its course has been found out. It is no longer a stream now but a narrow drainage channel called the Gandhānālā, which, rising at the Gomukhatekri just behind the Ujjain College. passes first through the Kṣīrasāgara, then through the most populous part of the city, and falls into the Śiprā at the northernmost point of what is regarded as the most sacred Kṣettra on the Śiprā.

Two inscriptions have been very recently discovered at Ujjain, one is lying at the Municipal office and is dated Samvat 1195, and the other is at the Municipal market and is dated Samvat 1547. The first inscription records the conquest of Malwa by Mahārājādhirāja Paramešvara Jaya Singha Deva.

But the most important inscription lately discovered in the country of Malwa is at Mandasore. It is dated in the Mālava Samvat 464. that is, A.D. 407. It speaks of the reigning prince as Naravarmā, the son of Siddhavarmā and the grandson of Jaya Varmā. Read with other inscriptions, found at Mandasore and published in the third volume of *Inscriptum Indicarum*, it gives the history of Western Malwa for about 150 years, both before and after its conquest by the Gupta Emperors of India.

The work done by the Bardic Department at Jodhpur is extremely satisfactory. Ṭhākur Sāheb Guman Singh Khici, Superintendent of the Historical Daftar of the Marwar Raj, has submitted the report of the Bardic Department for 1912. The following works have been copied for the use of the Asiatic Society of Bengal.

(1) Ajita-Carita in verse (contains a history of Mahārāja Gaja Singha, Yašovanta I and Ajit Singha. Anonymous).

(2) Khyāta or history in prose, from Puñj to Mahārāja Vijaya Singha.

(3) Khyāta or history in prose, from Ajitanārāyaṇa to Yašovanta Singha I.

(4) Khyāta or history in prose, from Mahārāja Ḍala Pāṅgula Jaya Cānd to Mahārāja Ajita Singha.

(5) Khyāta or history in prose, by Manāyet Nain Singh.

(6) Guṇabhāṣācittra, a history in verse of Mahārāja Gaja Singha.

(7) Ḍholā Mārāvanīki Vāt, a historical tale in prose.

(8) Bhojaki panaramī Vidyā, a historical tale.

(9) Jagadevapamārkivāt, a historical tale in prose of Jagadevapamār, whose daughter was married to Sāmalavarmā, a king of Eastern Bengal.

(10) Giṅgolikāvāt, a historical tale.

(11) Sivās Thākur Kupāvat Khīva Karn ki Kuṇḍaliā.

(12) Mahārāja Mān Singh ki Gīta by Sāndu Cāraṇa Cāindān.

Besides these, 45 more works are in the course of being copied, 62 have been collected from outside and information with regard to about 193 has been gathered. Ṭhākur Sāheb Guman Singh Khici and his staff deserve the thanks of all those who are interested in the Bardic Chronicles of Rajputana. The Regent, Mahārājā Sir Partab Singh, G.C.S.I., G.C.B., LL.D., is most liberally assisting the Asiatic Society in collecting these chronicles, and he has promised to continue the Bardic Section of the Historical Department of the State as long as the Society desires.

One of the most important services rendered to Bardic Literature of Rajputana and to the Hindi Literature generally, was the exhibition at a meeting of the Asiatic Society of Bengal held in the first week of December, 1912, by Paṇḍit Nānu Rām Brahma Bhāt, of some chapters of the real Pṛthvīrājrāsau, as composed by his distinguished ancestor Cānd Vardāi, the Court poet of Prthvīrāja who lost his empire of Delhi and Ajmere by the Muhammadan invasion of 1139. The controversy long raging in Western India, whether the current recension of that work is genuine, has been set at rest by the production of a fragment of Cānd's original work which was very short, while the current recension is very large.

Though a good deal of interest has been taken by the Mahārājā of Bikanir in the collection of Bardic works in his State, little has been done, as both His Highness and his Court were very busy this year with more important State functions. In fact, the Private Secretary to the Mahārajā wrote to the Shāstri not to go to Bikanir, as the people there were too busy to afford him any assistance. The Shāstri, therefore, utilized the time at his disposal in paying a visit to Bilāḍā which is the chief seat of an interesting religion called Ayīpanth.

The religion was preached by a lady who is known by her appellation Āyī or mother. The religion preached by her seems to be a survival of the Light Worship of some sort of ancient Iran, as the ancient history of this religion is mixed up with the name of Sams-Tabrez, the sun of Tabrez. In fact, an image

of his tomb is one of the chief objects of reverence to the followers of the Āyī. But the chief object of their worship is a light fed with ghee and kept in a dark room, along with some of the relics of the Āyīji herself. The lamp was lighted at Bilāḍā in Samvat 1521 when Ayīji first came there; and since then it has never been allowed to go out. They say it emits no smoke but a yellow substance called Kesāra or saffron.

Todd speaks in his history of Rājasthān of 36 races of Rajputs. The number 36 appears to be a traditional number and it does not apply so much to the Rajputs as to the Kṣattriyas generally. An account of the 36 races of Kṣattriyas has been found in Jodphur. The name of the work is Vaṃsāvali Viśāla. It is not a very ancient work, but it embodies a very ancient tradition. It says that there are 36 races of Kṣattriyas, of whom, 10 derived their origin from the Sun, 14 from the Moon, 8 from the Ṛsis and 4 from fire. The Kṣattriyas who derived their origin from the Ṛsis seemed the most ancient, because some of their names have been found even in the Ṛg. Veda. A study of this book opens a wide vista for research into the origin of the ruling races of India.

Catalogue of Sanskrit Manuscripts.

Mahāmahopādhyāya Haraprasad Shāstri, M.A., C.I.E., and his two assistants Pandits Ashutosh Tarkatīrtha and Nani Gopal Banerjee were engaged during the year in preparing a descriptive catalogue of manuscripts of the Government Collection in the Asiatic Society's Library. The number of manuscripts to be catalogued is 10,800 out of which 3100 were described during the years 1910 and 1911; 1600 more have been described in the course of the year under review and the number now stands at 4700.

Rājā Rajendralal Mitra, C.I.E., LL.D., collected altogether 3157 manuscripts. As these manuscripts were not well known to the Shastri, they were comparatively a difficult task to him. As the rest of the manuscripts have been collected by the Shāstri himself, it is expected that in future years the progress of the work will be a little more rapid. Still four years will be required to complete the catalogue, unless greater facilities are given to him.

The descriptive catalogue, so far prepared, contains notices of a large number of Jaina, Vaidika and Tāntrika works, absolutely unknown to the world. So it appears to many that the publication of the last three years' work is desirable. But the portion of the collection, not yet described, contains over 500 Buddhist and over 1700 Jaina manuscripts, the description of which is likely to increase the range of scholarly knowledge. Brahminic works of the highest importance in all the various branches of knowledge also await description. It is,

therefore, undesirable to publish anything before the completion of the catalogue in manuscript. If the catalogue is published after its completion, it will be possible to fix the chronology of many important branches of Sanskrit knowledge and also the dates of many important works.

Bureau of Information.

The Bureau of Information in the Asiatic Society was engaged in preparing a complete catalogue of the manuscripts found in the Bishop's College, Calcutta. It has also answered questions put to it by Civil Officers.

The Hon. Justice Sir Asutosh Mukhopadhyaya, Kt., Senior Vice-President, delivered an address to the Society.

Annual Address, 1913.

Mr. President and Members of the Society,

I deem it a high privilege to be permitted to deliver the Address this evening, and I trust I may look forward to the same kindness and forbearance from this learned audience as I enjoyed on previous occasions, notwithstanding the imperfections of my attempt to give, in response to the call from the Chair, a brief outline of the activities of the Society during the last twelve months.

It is a matter for congratulation that the material prosperity of the Society has been well maintained during the past year. There is no substantial falling-off in our numerical strength; indeed, the number of paying members has increased, while there has been a decrease in the list of non-paying members. Our financial condition is sound, and our expenditure has been strictly regulated. But the condition of our building has continued to be a source of some anxiety. Expert opinion decisively supports the view that though the building, which has now lasted for more than a century, may continue to serve our purpose for some time longer, we are in a more or less precarious position, and a sharp shock of earthquake would mean the complete ruin of our valuable Library, accumulated during a century and a quarter, and our inestimable collection of Sanskrit, Arabic and Persian manuscripts. The question of a substantial and commodious building adequate for our present needs and capable of needful expansion to meet our future demands, is pressing upon us with increasing insistence. As a result of the deliberations of the Building Committee during the last twelve months, the balance of

opinion is no longer in favour of a speculative building scheme which found some support several years ago. A scheme of that character is open to the obvious objection that it is inconsistent with the purposes of the Society; but it is equally open to the graver objection that it really involves an appreciable element of risk due to external circumstances wholly beyond our control, such as possible depreciation of land and building values owing to the transference of the Capital and other like unforeseen incidents. The most prudent course appears to be to erect a suitable structure on one portion of our property and to make the most profitable use of the remainder, which will unquestionably prove to be an asset of great value. I trust I may without impropriety restate my firm conviction that we are entitled to further assistance from the State in furtherance of the building scheme; such assistance would only be an appropriate recognition of the value of the entirely voluntary and unremunerated labours of successive generations of our members in the cause of the advancement of knowledge, the growth of which it is the duty of every truly enlightened Government to foster.

Let us now turn for a moment to the literary and scientific work accomplished by our members during the last twelve months; here we are gratified to find that a high standard has been maintained from the quantitative as well as the qualitative point of view. In the department of Philology and Antiquities, the researches of our members connect themselves with the work of previous investigators in several important directions. Mr. Kingsmill has attacked afresh the problem of the era of Vikramaditya and the foundation of the Kushan Kingdom in India, which, as is well known, has led to considerable diversity of opinion among learned scholars. Mr. Kingsmill has had access to Chinese sources, and he puts forward the view that the term Kanisha is not a proper name at all but a generic name for a king, and that the real founder of the Kushan Dynasty was Cadiphes, who was surnamed hero of heroes, king of Kushanas. This view must be regarded, upon the somewhat meagre materials available, as more or less hypothetical; but if the suggestion is ultimately confirmed, that this Cadiphes, who took possession of the Punjab and Western Magadha in 57 B.C., was identical with king Vikramaditya of Indian tradition, the discovery must be pronounced one of the most startling in Indian History and likely to revolutionize deep-rooted and firmly-settled ideas upon a fundamental point. Other writers amongst us made creditable attempts at identification of important personages or settlement of the dates of important events in later periods of Indian History. Mahamahopadhyaya Haraprasad Sastri maintains the affirmative of the thesis that the Sungas, who under their leader Puspamitra successfully persecuted the Buddhists and ultimately overthrew

the Maurya Empire, were not Persians as had been previously supposed, but were Brahmins of the Sama Vedic School accustomed to horse-sacrifice. The same writer quotes a passage from a palm-leaf manuscript to show that the poet Bhatti was the son of Sridhar Swami of Valabhi. On the other hand, a young scholar, Babu Surendranath Sastri, endeavours to establish that the poet was no other than the Bhatti Bhatta to whom Dhruba Sen, the third of Valabhi, granted a village in 653 A.D. Babu Brajalal Mookerjee takes up the question of the date of the great astronomer Varahamihira and reaches the conclusion that he chose the Saka year 427 as the starting-point of his astronomical calculations, possibly to commemorate the date of his own birth. Mr. Pargiter, one of our ex-presidents, whose retirement from this country deprived us of the last member of the Indian Civil Service who had attained distinction as a Sanskritist, has given us an important paper on the Ghagrahati grant which dates back to the reign of Samacara Deb in the 7th century. The genuineness of this grant is, I think, satisfactorily established, and it can no longer be treated as ambiguous or of doubtful import. In addition to this paper, we have a number of important epigraphical contributions. Mr. Ramaprasad Chanda endeavours to establish that the Kambojas were Kach Raj Bansis and that the inscription on the Dinajpur pillar, which records the erection of a temple of Siva by a Gaudian King of the Kamboja family, was prepared towards the close of the 10th century. Babu Rakhaldas Banerjee has turned his attention to the Blekhara inscription and the Machli-Sahara grant, and has reached the conclusion that Harischandra, the son of Jaychandra, reigned in Oudh for seven years after his father had lost his life in the battle of Chandawar. Mr. Mohanlal Pandia has subjected the Atapura inscription to a critical examination and reviewed the two conflicting theories, namely, that the kings of Mewar were of Suryya Vamsa origin and that the Chiefs were originally Nagar Brahmans. Babu Akshaykumar Maitra has discovered traces of Buddhism in the District of Maldah, and his find, which consists of two images, one of Buddha and the other of Bodhisattva Lokenath, cannot but arouse the interest of all serious students of Buddhistic Iconography. Of great interest is a paper by Ramanuja Swamy of the famous Vaisnab temple near Vizagapatam in the Madras Presidency, in which he repudiates the theory that the temple originally Saivait was subsequently converted to Vaishnabait purposes by Ramanuja in the twelfth century. These contributions are of undoubted value and interest; but the activity of our members in the direction of Sanskritic studies must not be judged solely by the papers mentioned; the publications which constitute the Bibliotheca Indica Series are of considerable importance and deserve more than a passing notice.

Amongst new works published during the last year, the place of honour must be given to the Tibetan version of a comprehensive Buddhist-Sanskrit commentary on the famous Sanskrit lexicon, Amarkosh, edited by Dr. Satischandra Vidyabhushan, who had previously brought to light the text of the lexicon itself from Tibetan sources. We have here a fresh illustration of the great possibilities of useful research in the domain of Sanskrit learning through the medium of Tibetan sources, and I am constrained to admit with feelings of keen disappointment that our progress in the pursuit of Tibetan studies has not been particularly creditable, since the days of our illustrious member Csoma de Koros, whose collected papers were recently republished by us and whose impressive figure will henceforth adorn our rooms through the courtesy of the Hungarian Academy. Considerable importance must also be attached to the publication of two interesting treatises on the school of Smriti or Law and Usage prevalent in Orissa, viz. the Smritiprakas and the Suri Sarvasva. It cannot be disputed that our attention has hitherto been monopolised principally, if not entirely, by the more famous digests of Hindu Law, and there is good ground for the suspicion that local customs and rules have consequently not received the attention they deserve. In the same series, we see the beginnings of literary and grammatical works of considerable importance, the Bhasa Britti, a commentary on the Grammar of Panini, and Saduktikarnamrita, a poetical anthology by Sridhar Das, dating back to the origin of Lakshman Sen who flourished in the twelfth century. It is a matter for genuine satisfaction that considerable activity has also been displayed during the last year in the matter of the publication of Arabic and Persian works of literary or historical importance such as the Persian fairy tale Gulriz, edited by the late lamented Mr. Azoo and Aga Muhammad Kazim Shirazi; the Shah Alam Nama, edited by the brilliant scholar too early lost to the cause of linguistic researches in this country, the late Mr. Harinath De; the memoirs of Shah Tahmasp, edited by our late Philological Secretary, Dr. Phillott; and the Shah Jehan Nama, edited by Prof. Yazdani. I trust I have said enough to indicate how varied and extensive is the collection of Sanskrit, Tibetan, Arabic and Persian works which still wait to be placed at the disposal of the learned world; in fact, the zeal with which our editors have worked has been so great that the funds at our disposal for the publication of these works has been exhausted, and we must either press for a substantial increase of the Government grant or considerably restrain the activity of our editors. The situation is rather embarrassing, and the difficulty is enhanced by the fact that, as the search for Sanskrit, Arabic and Persian manuscripts is vigorously carried on, fresh materials are brought to light which it is

incumbent on us as a learned body to bring within the easy reach of scholars interested in the progress of Oriental studies. To take one illustration only, Mahamahopadhyaya Haraprasad Sastri has, in the course of his searches for Sanskrit manuscripts, come across a copy of an important work on Hindu Law called Smriti Manjari by Gobindaraja, the great commentator on the Institutes of Manu. This manuscript dates back to the year 1145 and effectively contradicts the theory put forward by Prof. Julius Jolly that Gobindaraja flourished between the 11th and the 15th centuries and could be identified with King Gobindachandra of Kanauj. One can imagine without difficulty the stir which would be created in the learned world of Orientalists by the publication of an accurate edition of this work. The Sastri has also been fortunate enough to come across a palm-leaf manuscript of Parasara Smriti, copied in 1142. We cannot but lament that the funds at our disposal make it impossible for us to publish works of this description at an early date, and even to have them properly catalogued. I feel assured that if the importance of the undertaking was better recognized and more liberal grants allowed for the purpose, there would be no lack of Sanskritists amongst the younger generation of our scholars to explore this field, with honour to the Society and advantage to the cause of learning. Before I pass away finally from this department of our work, I may dwell for a moment upon the progress recently made in the search for Bardic Chronicles. The importance of research in this direction cannot be overestimated or too frequently reiterated. If ever the history of the Rajput States is to be correctly appreciated and the development and downfall of the great military race of India graphically depicted, an accurate and exhaustive collection must speedily be made of the traditions handed down from generation to generation by the bards of Rajputana. In the course of his third tour, the Sastri has come across important collections at Ujjain, Jodhpur and Mundi, and has discovered the original of the real Prithvirajarasau, composed by Chand. the illustrious Court-poet of Prithviraj, the last Hindu Emperor of Delhi. It is now conclusively established that the work of Chand, in its original form, was of moderate length. and has attained its present size by successive accretions not always easy to differentiate from the genuine original. The field of work thus brought to light is extensive, and as soon as the final report of the results achieved is prepared, we shall be in a position to make out a strong case for renewal of the grant for search of Bardic Chronicles.

In the domain of the Natural and Physical Sciences, we have a number of important papers embodying recondite researches which it is not easy to make intelligible to the lay mind. It is sufficient to say that two further instalments have been published of the monumental work of Mr. Gamble on

the Flora of the Malayan Peninsula. Dr. Praphullachandra Ray and his pupils have made important contributions, well calculated to maintain the reputation of the chemical laboratory of the Presidency College. Dr. Annandale has given us a paper on some recent advances in our knowledge of the fresh-water fauna in India, and we are all grateful to him in that he puts the most recondite things in Zoology in a way intelligible to persons, who, like me, can make no pretension to technical zoological knowledge; that is an invaluable gift not possesed by many, and I am afraid that even those who possess it, do not always feel inclined to utilize it for the benefit of the non-technical reader. To guard against any possible misconception, I may be permitted to lay stress here on the fact that the scientific papers published in our journal do not by any means afford a fair indication of the true extent of the scientific activities of our members. It cannot be overlooked that their researches are, in the main, published in official periodicals specially maintained for the purpose. It would be, therefore, most unfair to institute a comparison between our publications now and half a century ago and then to draw an inference adverse to the reputation of the present generation of our members.

I regret that the time at my disposal makes it impossible for me to give a more minute and more extended analysis of the work upon which our members have been engaged during the last twelve months: but I venture to express the hope that even this imperfect account may, in some measure, serve to indicate the unselfish devotion with which our members have endeavoured to advance the bounds of knowledge, to the best of their ability and with the limited resources placed at their disposal. No scholar, even superficially acquainted with the history of philological or scientific research, can legitimately express a disappointment that epoch-making discoveries are not made once every twelve months. The work which lies before the investigator of the present generation is full of obvious difficulties, and he can hardly be expected nowadays to announce striking results merely upon the reading of a new text, the deciphering of a new inscription or the observation of a hitherto unnoticed natural fact or phenomenon. The most patent truths have been already investigated and announced, and the most devoted student can ordinarily hope only to extend the bounds of knowledge in directions previously indicated and partially explored. In the accomplishment of this difficult task, the members of our Society have strenuously and successfully laboured, and I eanestly trust that they will pursue their enquiries with renewed vigour under the auspices of that distinguished statesman and scholar who has consented to watch our interests and preside over our deliberations during the next twelve months.

The President announced the election of Officers and Members of Council for the year 1913 to be as follows :—

President :

His Excellency the Right Hon. Thomas David Baron Carmichael of Skirling, G.C.I.E., K.C.M.G.

Vice-Presidents :

Colonel G. F. A. Harris, C.S.I., M.D., F.R.C.P., I.M.S.
G. Thibaut, Esq., C.I.E., Ph.D., D.Sc., F.A.S.B.
Mahamahopadhyaya Haraprasad Shastri, C.I.E., M.A., F.A.S.B.
D. Hooper, Esq., F.C.S., F.L.S., F.A.S.B.

Secretary and Treasurer :

General Secretary :—G. H. Tipper, Esq., M.A., F.G.S.
Treasurer :—The Hon. Justice Sir Asutosh Mukhopadhyaya, Kt., C.S.I., D.L., D.Sc., F.R.S.E., F.R.A.S., F.A.S.B.

Additional Secretaries :

Philological Secretary :—Capt. C. L. Peart, 106th Hazara Pioneers.
Natural History Secretary :—W. A. K. Christie, Esq., B.Sc., Ph.D.
Anthropological Secretary :—J. Coggin Brown, Esq., M.A., F.G.S., F.C.S.
Joint Philological Secretary :—Mahamahopadhyaya Satis Chandra Vidyabhusana, M.A., Ph.D., F.A.S.B.
Medical Secretary :—Capt. J. D. Sandes, M.B., I.M.S.

Other Members of Council :

E. P. Harrison, Esq., Ph.D.
H. H. Hayden, Esq., C.I.E., B.A., B.A.I., F.G.S., F.A.S.B.
N. Annandale. Esq., D.Sc., C.M.Z.S., F.L.S., F.A.S.B.
W. K. Dods, Esq.
S. W. Kemp, Esq., B.A.
H. G. Tomkins, Esq., C.I.E., F.R.A.S.
W. C. Hossack, Esq., M.D., D.P.H.
Capt. R. B. Seymour Sewell, M.R.C.S., L.R.C.P., I.M.S.

The President also announced the election of Fellows to be as follows :—

Major A. T. Gage, I.M.S.
E. Vredenburg, Esq., B.L., B.Sc., A.R.M.S., A.R.C.S., F.G.S
J. P. Vogel, Esq., Ph.D., Litt.D.
S. W. Kemp, Esq., B.A.

The meeting was then resolved into the Ordinary General Meeting.

COLONEL G. F. A. HARRIS, C.S.I., M.D., F.R.C.S., I.M.S., in the chair.

The minutes of the last meeting were read and confirmed.

Fifty-nine presentations were announced.

The General Secretary reported the death of Mr. V. Venkayya.

Mr. Ekendranath Ghosh, L.M.S., B.Sc., was balloted for as an Associate Member.

The following papers were read :—

1. *Indian Dermaptera collected by Dr. A. D. Imms. By* MALCOLM BURR. *Communicated by* DR. N. ANNANDALE.

This paper will be published in a subsequent number of the *Journal*.

2. *The Composition of the Water of the Lake of Tiberias. By* DR. W. A. K. CHRISTIE.

3. *Aquatic Oligochaeta of the Lake of Tiberias. By* MAJOR J. STEPHENSON.

These two papers have been published in the *Journal* for January 1913.

4. *Notes on Fr. C. Gomez Rodeles' article on the Earliest Jesuit Printing in India. By* REV. H. HOSTEN, S.J.

This paper will be published in a subsequent number of the *Journal*.

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The Adjourned Meeting of the Medical Section of the Society was held at the Society's Rooms on Wednesday, the 12th February, 1913, at 9-30 P.M.

DR. W. C. HOSSACK in the chair.

The following members were present :—

Dr. Adrian Caddy, Major E. D. W. Greig, I.M.S., Lieut.-Col. A. H. Nott, I.M.S., Lieut.-Col. L. Rogers, I.M.S.

The minutes of the last meeting were read and confirmed.

The following paper was read :—

On Causes of death and errors of Diagnosis in one thousand Post-Mortems.—By LIEUT.-COL. L. ROGERS, C.I.E., I.M.S.

LIST OF MEMBERS

OF THE

ASIATIC SOCIETY OF BENGAL.

ON THE 31ST DECEMBER, 1912.

LIST OF OFFICERS AND MEMBERS OF COUNCIL OF THE ASIATIC SOCIETY OF BENGAL FOR THE YEAR 1912.

President :

Colonel G. F. A. Harris, C.S.I., M.D. F.R.C.P., I.M.S.

Vice-Presidents :

The Hon'ble Justice Sir Āsutosh Mukhopādhyāya, Kt., C.S.I., M.A., D.L., D.Sc., F.R.S.E., F.R.A.S., F.A.S.B.
G. Thibaut, Esq., Ph.D., C.I.E., F.A.S.B.
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Lieut.-Colonel L. Rogers, C.I.E., M.D., I.M.S.

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LIST OF ORDINARY MEMBERS.

R. = Resident. N.R. = Non-Resident. A. = Absent. L.M. = Life Member.
F.M. = Foreign Member.

An Asterisk is prefixed to the names of the Fellows of the Society.

N.B.—Members who have changed their residence since the list was drawn up are requested to give intimation of such a change to the Honorary General Secretary, in order that the necessary alteration may be made in the subsequent edition. Errors or omissions in the following list should also be communicated to the Honorary General Secretary.

Members who are about to leave India and do not intend to return are particularly requested to notify to the Honorary General Secretary whether it is their desire to continue Members of the Society; otherwise, in accordance with Rule 40 of the rules, their names will be removed from the list at the expiration of three years from the time of their leaving India.

Date of Election.		
1907 April 3.	N.R.	Abdul Ali, Abul Faiz Muhammad, M.A., Deputy Magistrate. *Netrokona, Mymensingh.*
1909 Mar. 3.	N.R.	Abdul Latif, Syed, Deputy Magistrate. *Barisal.*
1894 Sept. 27.	L.M.	Abdul Wali, Maulavi. 23, *European Asylum Lane, Calcutta.*
1912 Aug. 7.	N.R.	Abdulla-ul-Musawy, Syed, B.A., Zemindar. *Bohar, Burdwan.*
1909 July 7.	R.	Abdur Rahim, Maulavi. 51, *Taltolla Lane, Calcutta.*
1895 May 1.	R.	Abdus Salam, Maulavi, M.A., Presidency Magistrate. *Calcutta.*
1903 April 1.	N.R.	Abul Aâs, Maulavi Sayid, Raees and Zemindar. *Langar Toli, Bankipore.*
1904 Sept. 28.	N.R.	Ahmad Hasain Khan, Munshi. *Jhelum.*
1911 April 5.	N.R.	Ahmad Husain, Shaikh, *Khan Bahadur*, Rais of *Pargawan, Partabgarh, Dist. Oudh.*
1888 April 4.	R.	Ahmud, Shams-ul-Ulama Maulavi. 3, *Maulavi's Lane, Calcutta.*
1899 Jan. 4.	N.R.	Ali Hussain Khan, Nawab. *Lucknow.*
1903 Oct. 28.	R.	Allan, Alexander Smith, M.B. 5, *Esplanade, East, Calcutta.*
1893 Aug. 31.	N.R.	Anderson, Lieut.-Col. Adam Rivers Steele, B.A., M.B., D.P.H., C.M.Z.S., I.M.S. *Chittagong.*
1884 Sept. 3.	A.	Anderson, J. A. *Europe.*
1912 July 3.	N.R.	Andrews, Egbert Arthur, B.A. *Tooklai Experimental Station, Cinnenara P.O. Jorhat, Assam.*

Date of Election.		
1904 Sept. 28.	R.	*Annandale, Nelson, D.Sc., C.M.Z.S., F.A.S.B., Superintendent, Indian Museum. *Calcutta.*
1910 Apl. 6.	N.R.	Ascoli, Frank David, I.C.S. *Dacca.*
1909 May 5.	R.	Ashgar, A. A., Barrister-at-Law. 8, *European Asylum Lane, Calcutta.*
1911 May 3.	R.	Atkinson, Albert Charles. 11, *Loudon Street, Calcutta.*
1904 July 6.	N.R.	Aulad Hasan, Sayid, *Khan Bahadur*, Inspector of Registration. *Dacca.*
1909 May 5.	R.	Azad, Maulavi Abul-Kalam Mohyuddin Ahmad. 13, *McLeod Street, Calcutta.*
1870 Feb. 2.	L.M.	Baden-Powell, Baden Henry, M.A., C.I.E. *Ferlys Lodge, 29, Banbury Road, Oxford, England.*
1891 Mar. 4.	N.R.	Baillie, Hon. Mr. Duncan Colvin, I.C.S., Member, Board of Revenue, North-West Provinces of Agra and Oudh. *Allahabad.*
1909 Feb. 3.	N.R.	Banerjee, Charu Deb, B.A., LL.B. *Allahabad.*
1910 Dec. 7.	N.R.	Banerji, Devendra Kumar. *Dacca College, Dacca.*
1905 Mar. 1.	R.	Banerjee, Muralidhar. *Sanskrit College, Calcutta.*
1907 Jan. 2.	R.	Banerji, Rakhal Das, M.A. 45/4, *Simla Street, Calcutta.*
1908 Mar. 4.	R.	Banerji, Satis Kumar. 45, *Baniatola Lane, Calcutta.*
1896 Mar. 4.	N.R.	Banerji, Satish Chandra, M.A., LL.D., Advocate, High Court. *Allahabad.*
1911 June 7.	N.R.	Barik, Ganesh Lall, *Zemindar, Chandchaura, Gaya.*
1869 Dec. 1.	L.M.	Barker, Robert Arnold, M.D., F.G.S. *Thorncroft, Horndean Road, Emsworth, Hants, England.*
1885 Nov. 4.	R.	Barman, Damodar Das. 55, *Clive Street, Calcutta.*
1898 Mar. 2.	N.R.	Barnes, Herbert Charles, M.A., I.C.S., Magistrate and Collector. *Sylhet, Assam.*
1908 Nov. 4.	N.R.	Barnes, James Hector, B.Sc., F.I.C., F.C.S., Principal, Punjab Agricultural College, and Agricultural Chemist, Punjab Govt. *Lyallpur, Punjab.*
1902 May 7.	R.	Bartlett, Edward William John. 4, *Esplanade, East, Calcutta.*
1894 Sep. 27.	R.	Basu, Nagendra Nath. 20, *Kantapuker Lane, Baybazaar, Calcutta.*
1903 Feb. 4.	N.R.	Batra, Bhawani Das, *Rai Bahadur*, M.A., Revenue Asst. *Amritsar.*
1909 July 7.	N.R.	Bazuz, Rangnath Khunraj. *Girgaon, Bombay.*
1895 July 3.	L.M.	Beatson-Bell, Hon. Mr. Nicholas Dodd, B.A., C.I.E., I.C.S. *Dacca.*

Date of Election.		
1907 Feb. 6.	N.R.	Bell, Charles Alfred, I.C.S. *Gangtok, Sikkim.*
1909 April 7.	N.R.	Bentley, Charles A., M.B., D.P.H. Special Sanitary Commissioner. *Shillong.*
1906 Nov. 7.	N.R.	Bergtheil, Cyril. *Sirseah, Mozufferpore.*
1876 Nov. 15.	F.M.	*Beveridge, Henry, F.A.S.B., I.C.S. (retired). *Pitfold, Shottermill, Haslemere, Surrey, England.*
1908 Nov. 4.	N.R.	Bhattacharji, Bisvesvar, Settlement Officer. *Faridpur.*
1909 Aug. 4.	N.R.	Bhattacharjee, Jyotis Chandra, M.A., B.L. *Purneah.*
1910 April 6.	R.	Bhattacharyya, Ramakanta. 77, *Lansdowne Road, Calcutta.*
1909 July 7.	R.	Bhattacharjee, Shib Nath, M.B. 26, *Patal-danga Street, Calcutta.*
1911 April 5.	R	Bion, H. S., B.SC., F.G.S., Assistant Superintendent, Geological Survey of India. *Calcutta.*
1910 May 4.	N.R.	Bishop, T. H., M.R.C.S., L.R.C.S., D.P.H. *Paksey, Pabna Dist.*
1893 Feb. 1.	N.R.	Bodding, Revd. P. O. *Dumka, Sonthal Parganas.*
1912 Oct. 30.	N.R.	Bolton, H. O. *Graham's Building, Rangoon.*
1912 July 3.	R.	Bomford, Lieut. Trevor Lawrence, I.M.S., M.B., B.S., M.R C.S., L.R.C P. 27, *Chowringhi Road, Calcutta.*
1909 July 7.	R.	Bonerji, Ratnakrishna Curran. 11, *Ballygunge Circular Road, Calcutta*
1895 July 3.	N.R.	Bonham-Carter, Hon. Mr. Norman, I.C.S. *Dacca.*
1898 Feb. 2.	R	Bose, Amrita Lal, Dramatist. 9-2, *Ram Chandra Maitra's Lane, Calcutta.*
1908 June 3.	R.	Bose, Hira Lall, *Dewan Bahadur*, L.M.S. 25 2, *Mott's Lane, Calcutta.*
1895 Mar. 6.	R.	*Bose, Jagadis Chandra, C.S.I., M.A., D.Sc., C.I.E., F.A.S.B. *Presidency College, Calcutta.*
1910 July 6.	N.R.	Botham, Arthur William, I.C.S. *Shillong.*
1911 Nov. 1.	N.R.	Boyle, Lieut. Cecil Alexander, 11th King Edward's Lancers, Cavalry Lines, The Kurram Valley Militia, Parachinar, Kurram Valley. *N.-W. F. P.*
1906 Sept. 19.	N.R.	Bradley-Birt, Francis Bradley, I.C.S. *Khulna.*
1908 Jan. 1.	R.	Brahmachari, Upendra Nath, M.A., M.D. 10, *Nimtola Ghat Street, Calcutta.*
1906 July 4.	R.	Brown, Lieut.-Col. Edwin Harold, M.D., I.M.S. (retired). 4, *Harington Street, Calcutta.*
1907 July 3.	R.	Brown, John Coggin, M.Sc., F.G.S., F.C.S., Assistant Superintendent, Geological Survey of India. *Calcutta.*
1909 Oct. 6.	R.	Brown, Percy, A.R.C.A. *Government School of Art, Calcutta.*

Date of Election.		
1905 Mar. 1.	A.	Brown, William Barclay, I.C.S. *Europe.*
1909 Oct. 6.	N.R.	*Brühl, Paul Johannes, F.A.S.B. *Bangalore.*
1901 Sept. 25.	R.	Buchanan, Lieut.-Col. Walter James, I.M.S. *United Service Club, Calcutta.*
1901 June 5.	F.M.	*Burkill, Isaac Henry, M.A., F.A.S.B. *Botanical, Garden, Singapur.*
1896 Jan. 8.	N.R.	Burn, Hon. Mr. Richard, I.C.S. *Allahabad*
1912 Apl. 3.	R.	Burns, William Alexander, B.A. 4, *Metapooker Road, Kidderpur.*
1900 May 2.	N.R.	Butcher, Flora, M.D. *Lohaghat, Almora Dist.*
1898 Sept. 30	A.	Cable, Sir Ernest, Kt. *Europe.*
1906 Dec. 5.	R.	Caddy, Adrian, M.D. (Lond.), F.R.C.S. (Eng.), D.P.H., M.R.C.P.S. (Lond.). 2-2, *Harington Street, Calcutta.*
1907 Apl. 3.	R.	Calvert, Lieut.-Col. John Telfer, M.B., M.R.C.P., I.M.S. 14, *Russell Street, Calcutta.*
1907 Mar. 6.	L.M.	Cama, Camaji Byramji Navroji, B.A., LL.B., I.C.S. *Raipur.*
1901 Mar. 6.	N.R.	Campbell, William Edgar Marmaduke, I.C.S. *Lucknow.*
1895 July 3.	N.R.	Carlyle, Hon. Sir Robert Warrand, K.C.S.I., C.I.E., I.C.S., Revenue and Agriculture and P.W.D. Member, Government of India. *Simla.*
1912 Mar. 6.	R.	Carmichael. His Excellency the Right Hon'ble Thomas David Baron, of Skirling, G.C.I.E., K.C.M.G., Governor of Bengal. *Calcutta.*
1911 Feb. 1.	R.	Carnduff, Hon. Mr. Justice Herbert William Cameron, C.S.I., I.C.S. 5, *Hungerford St., Calcutta.*
1910 May 4.	N.R.	Carter, Capt. Robert Markham, I.M.S. *Bombay.*
1905 May 3.	R.	Chakravarti, Dwarkanath, M.A., B.L., Vakil, High Court. *Calcutta.*
1890 June 4.	N.R.	*Chakravarti, Monmohan, M.A., B.L., F.A.S.B., Deputy Magistrate. *Khulna.*
1909 Mar. 3.	R	Chakravarti, Nilmani, M.A. *Presidency College, Calcutta.*
1905 July 5.	N.R.	Chakravarti, Vanamali. *Sri Pratab College, Srinagur.*
1906 Jan. 3.	R.	Chapman, John Alexander, Librarian, Imperial Library. *Calcutta.*
1908 Feb. 5.	R.	Chatterjee, Gopal Chandra, M.B. *Medical College, Calcutta.*
1911 June 7.	R.	Chatterjee, Karuna Kumar, F.R.C.S. 154, *Dharamtola St., Calcutta.*
1909 Mar. 3.	R.	Chatterjee, Manmatha Nath, M.B. 295/1, *Upper Circular Road, Calcutta.*
1907 Sept. 25.	R.	Chatterjee, Promode Prakas. 8, *Dixon Lane, Calcutta.*

Date of Election.		
1902 Aug. 27.	R.	Chaudhuri, Hon. Mr. Justice Ashutosh. 47 *Old Ballygunge, Calcutta.*
1893 Sept. 28.	R.	Chaudhuri, Banawari Lal, B.A., B.Sc. (Edin.), F.R.S.E., F.L.S. (Lond.) 120, *Lower Circular Road, Calcutta.*
1911 Mar. 1.	N.R.	Chaudhuri, Charu Chandra, Zemindar, Sherpur Town, *Mymensingh Dist.*
1912 Aug. 7.	N.R.	Chetty, P. S. Ramulu. 5, *Strotton Muthia, Mudelly, Street, Georgetown, Madras.*
1907 July 3.	R.	Christie, William Alexander Kynock, B.Sc., Ph.D. Chemist, Geological Survey of India, *Calcutta.*
1909 Nov. 3	N.R.	*Christophers, Major Samuel Richmond, M.B., F.A.S.B., I.M.S. *Research Laboratory, Kasauli.*
1902 April 2.	R.	Chunder, Rajchunder, Attorney-at-Law. 2, *Old Post Office Street, Calcutta.*
1906 Nov. 7.	N.R.	Clarke, Geoffrey Roth, I.C.S. *Postmaster-General, Allahabad.*
1907 Dec. 4.	A.	Cohen, Rachel Nathaniel, M.B., F.R.C.S. *Europe.*
1906 July 4.	A.	Connor, Captain Frank Powell, F.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S. *Europe.*
1910 July 6.	N.R.	Conyngham, Major G P. Lenox, R.E. *Dehra Dun.*
1908 Nov. 4.	N.R.	Cook, Capt. Lewis, I.M.S. *Midnapur.*
1912 June 5.	R.	Coppinger, Major Walter Valentine, M.B., B.Sc., F.R.C.S.I., I.M.S. 6, *Harrington Street, Calcutta.*
1898 June 1.	F.M.	Cordier, Dr. Palmyr. 20, *Boulavard Gambetta,* 20, *Hanoi (Tonkin), French Indo-China.*
1907 July 3.	R.	Cotter, Gerald de Purcell, Assistant Superintendent, Geological Survey of India. *Calcutta.*
1908 Jan. 1.	R.	Crake, Dr. Herbert Milverton. 15, *Park Street, Calcutta.*
1901 June 5.	A.	Crawford, Lieut.-Col. Dirom Grey. I.M.S. *Europe.*
1876 Mar. 1.	F.M.	Crawfurd, James, B.A., I.C.S. (retired). *Thornwood, Uddington, Lanarkshire, Scotland.*
1887 Aug. 25.	R.	Criper, William Risdon, F.C.S., F.I.C., A.R.S.M. *Konnagar, E.I.R.*
1912 May 1.	R.	Cullis, Henry Thorean, I.C.S. *U.S. Club, Calcutta.*
1895 July 3.	R.	Cumming, Hon. Mr. John Ghest. C.I.E., I.C.S. *Secy., Govt. of Bengal, Revenue and Genl. Dept., Calcutta.*
1873 Dec. 3.	F.M.	Dames, Mansel Longworth, I.C.S. (retired). *Ventnor, Wodeland Road, Guildford, Surrey, England.*
1901 Aug. 28.	N.R.	Das, Govinda. *Durgakund, Benares City.*

Date of Election.		
1896 Mar. 4.	R.	Das-Gupta, Jogendra Nath, B.A. (Oxon), Barrister-at-Law. *Hughli College, Chinsura.*
1912 April 3.	N.R.	Das, Kasi Nath, Prof. Ravenshawe College. *Cuttack.*
1879 April 7.	N.R.	Das, Ram Saran, *Rai Bahadur*, M.A., Manager, Oudh Commercial Bank, Ld. *Fyzabad.*
1910 Jan. 5.	R.	David, David A. 55, *Free School Street, Calcutta.*
1895 Sept. 19.	N.R.	De, Kiran Chandra, B.A., I.C.S. *Dacca.*
1906 Dec. 5.	R.	Deare, Lieut.-Col. Benjamin Hobbs, M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.P.H. (Cantab), I.M.S. *United Service Club.*
1899 Aug. 30.	N.R.	Deb, Raja Saccidananda Tribhuban, Feudatory Chief of Bamra. *Deogarh, Bamra.*
1904 Sept. 28.	N.R.	DeCourcy, William Blennerhasset. *Silchar P.O., Cachar.*
1912 May 1.	R.	Demetriadi, Stephen. 2/1 *Russell Street, Calcutta.*
1906 Dec. 5	N.R.	Dentith, Arthur William, I.C.S. *Cooch Behar.*
1904 Jan. 6.	N.R.	Dev-Sharman, Gulab Shanker, F.T.S., M.R.A.S., Private Secretary to H.H. the Maharani Sahiba of Bettiah. *Allahabad.*
1901 June 5.	R.	Dey, Nundolal. *Chinsura.*
1910 Dec. 7	A.	Dharmapala, The Anagarika Hevavitarana. *Europe.*
1910 May 4.	L M	Dhavle, Sankara Balaji, I.C.S. *Nawadah.*
1912 July 3.	R.	Digby, Everard, B.Sc. (Lond.). 1, *Garstin's Place, Calcutta.*
1907 Oct. 30	N.R.	Dixit, Pandit Sri Ram, B.A., *Dewan of Banswara, Rajputana.*
1898 Jan. 5.	R.	Dods, William Kane. Agent, Hongkong and Shanghai Banking Corporation. *Calcutta.*
1906 Dec. 5.	N.R.	Donnan, Major William, Indian Army, Examiner of Ordnance Factory Accounts in India. *Lucknow.*
1909 Nov. 3.	N.R	Donovan, Lieut.-Col. Charles, M.D., I.M.S. *Medical College, Madras.*
1902 July 2.	R.	Doxey, Frederick. 47/1, *Theatre Road, Calcutta.*
1909 Aug. 4.	N.R.	Drake-Brockman, Hon. Sir Digby Livingstone, kt., I.C.S. *Jhansi.*
1892 Sept. 22.	N.R.	Drury, Lieut.-Col. Francis James, I.M.S. *Ranchi.*
1912 Nov. 6.	N R.	Dube, Manana. *Tahsildar, Dist of Ballia, U.P.*
1912 April 3.	N.R.	Duff-Sutherland-Dunbar, Capt. Sir George, Bart., Commandant, Military Police. *Lukhimpur, Dibrugarh.*
1905 April 5.	A.	Dunnett, James Macdonald, I.C.S., *Europe.*
1877 Aug. 30.	R.	Dutt, Kedar Nath. 1, *Sikdarpara Lane, Calcutta.*

Date of Election.		
1906 Nov. 7.	F.M.	Eadie, Capt. John Inglis. 97*th Deccan Infantry*, C/o Messrs. Grindlay & Co., 45, *Parliament Street, London.*
1900 July 4.	N.R.	Earle, Hon. Sir Archdale, K.C.I.E., I.C.S. *Shillong.*
1910 April 6.	N R.	Ebden, Capt. F. T. P 73*rd Cavalry, Trichinopoly.*
1903 May 6.	A	Edwards, Walter Noel. *Europe.*
1910 May 6.	N.R.	Edwards, Lieut. W. M., Indian Army. *Barian, Murree Hills.*
1910 April 6.	R.	Elmes, Dr. Cecil H. 2, *Middleton Row, Calcutta.*
1911 Nov. 1.	R	Esch. V. J., Architect. 25, *Park St., Calcutta.*
1901 Mar. 6.	N.R.	Fergusson, John Carlyle, I.C.S. *Saharanpur.*
1904 Aug. 3.	R.	Fermor, Lewis Leigh, A.R.S.M., D.Sc., F.G.S., Superintendent, Geological Survey of India. *Calcutta.*
1908 Sept. 2.	N.R.	Fida Ali, Syed, *Arrah.*
1906 Dec. 5.	R.	Finck, Herman H. G., M.D., Surgeon to the Consulate-General for Germany. 19, *Camac Street, Calcutta.*
1906 Oct. 31.	N.R	Finlow, Robert Steel, Fibre Expert to the Govt. of Assam. *Dacca.*
1907 Mar. 6.	A.	Firminger, Revd. Walter Kelly, M.A., B.D., F.R.G.S. *Europe.*
1910 Sept. 7.	N.R.	Fortescue, Capt. Archer Irvine, R.A.M.C. *Benares.*
1906 Dec. 5.	A.	Foster, Captain Henry Bertram, I.M.S. *Europe.*
1910 April 6.	N.R.	Francis, Lieut. Reginald Frankland, Indian Army. *Jullunder, Punjab.*
1910 Nov. 2.	N.R.	Friend-Pereira, Joseph Ernest, B.A. *Bhagalpur.*
1903 Mar. 4.	R.	Gage, Major Andrew Thomas, M.A., M.B., B.Sc., F.L.S., I.M.S. *Royal Botanic Garden, Sibpur, Howrah.*
1893 Jan. 11.	N.R	*Gait, Hon. Mr. Edward Albert, C.I.E., I.C.S. *Ranchi.*
1912 Mar. 6.	R.	Ganguli, Manmohan, B.E., District Engineer. 50, *Raja Rajballava's Street, Calcutta.*
1909 Mar. 3.	R.	Ganguli, Matilal, *Rai Bahadur. Currency Office, Calcutta.*
1909 Oct. 7.	R.	Ganguli, Ordhendhu Kumar. 12, *Ganguli's Lane, Calcutta.*
1908 Feb. 5.	N.R.	Gardner-Brown, John Gerald Gardner, M.A. Director, State Education, *Holkar College, Indore.*
1908 Jan. 1.	N.R.	Ghatak, Suresh Chandra, Depy. Magistrate and Depy. Collector. *Dacca.*
1905 May 3.	N.R.	Ghose, Hemendra Prasad, Zemindar and Litterateur. *Prasad Lodge, Chungalbha P.O., Jessore.*

Date of Election.		
1889 Jan. 2.	R.	Ghose, Jogendra Chandra, M.A., B.L., Pleader. 25, *Hurrish Chunder Mookerjee Road, Bhowanipore, Calcutta.*
1909 Dec. 1.	A.	Ghose, Panchanan, M.A. *Europe.*
1905 July 5.	R	Ghosh, Amulya Charan, *Vidyabhusana.* 66, *Manicktolla Street, Calcutta.*
1912 Aug. 7.	R.	Ghosh, Atal Behari, M.A., B.L. 59, *Sookea's Street, Calcutta.*
1907 Oct. 30.	R.	Ghosh, Birendra Nath, L.M.S., Medical Practitioner. 109, *College Street, Calcutta.*
1912 Mar. 6.	R.	Ghosh, Harinath, M.D., Asst. Surgeon. 91, *Maincktala Street, Calcutta.*
1907 Mar. 6.	R.	Ghosh, Prafulla Chundra, M.A. 27/3, *Boitakhana Bazar Road, Calcutta.*
1869 Feb. 3.	N.R.	Ghosh, Pratapa Chandra, B.A. *Vindyachal.*
1912 Sept. 4.	R	Ghosh, Tarapada. 14, *Paddapuker Street, Kidderpur.*
1902 June 4.	N.R.	Ghuznavi, Abu Ahmed. *Mymensingh.*
1909 April 7.	R.	Goenka, Briz Mohan. 24, *Banstolla Street, Calcutta.*
1907 Mar. 6.	R.	Goenka, Roormall 57, *Burtolla Street, Calcutta.*
1905 July 5.	N.R.	Gossain, Hemchandra, Extra Assistant Commissioner. *Tezpur.*
1909 Jan. 6.	R.	Gourlay, William Robert, I.C.S. *Government House, Calcutta.*
1910 Sept. 7.	R.	Gravely, Frederic Henry, M.Sc., Asstt. Supdt., Indian Museum. *Calcutta.*
1905 May 3.	R.	Graves, Henry George, A.R.S.M. 1, *Council House Street, Calcutta.*
1910 Nov. 2.	N.R.	Graves-Law, H. D., I.C.S. *The Regency, Hyderabad, Deccan.*
1907 June 5.	R.	Green, Lieut.-Col. Charles Robert Mortimer, M.D., F.R.C.S., I.M.S. 6, *Harrington Street, Calcutta.*
1910 Mar. 2	R	Greig, Major Edward David Wilson, M.B., I.M.S. *United Service Club, Calcutta.*
1910 Sept. 7.	N.R	Grey, Major William George, Indian Army. Asst. Political Agent, Loraly. *Quetta.*
1900 Dec. 5.	L.M.	Grieve, James Wyndham Alleyne, Deputy Conservator of Forests. *Darjeeling.*
1910 April 6	A.	Grubl, D. E. *Europe.*
1901 April 3.	N.R.	Guha, Abhaya Sankar, Extra Assistant Commissioner. *Nowgong.*
1898 June 1.	R.	Gupta, Bepin Behari. *Hooghly College, Chinsura.*
1911 Aug. 2	N.R.	Habiber Rahman, Depy. Supdt., Telegraph Department. *Allahabad.*
1901 Mar. 6.	N.R.	Habibur Rahman Khan, Maulavi, Raees. *Bhikanpur, Dt. Aligarh.*

Date of Election.		
1892 Jan. 6.	F.M.	Haig, Lieut.-Col. Wolseley, Indian Army. C/o H. S. King & Co. 9, *Pall Mall, London, S.W.*
1907 Aug. 7.	N.R	Haines, Henry Haselfoot, F.C.S., F.L.S. *Nagpur.*
1909 Nov. 3.	R.	Hale, Alexander, M.I.C.E.I. *Howrah.*
1908 June 3.	R.	Hallowes, Kenneth Alexander Knight, B.A., A.R.S.M., F.G.S., Assistant Superintendent, Geological Survey of India. *Calcutta.*
1904 Sept. 28.	N.R.	Hallward, Norman Leslie. *Ranchi.*
1912 May 1.	R.	Harley, A. H. *Madrassa, Calcutta.*
1906 Dec. 5.	N.R.	Harris, Lieut. G. *56th Infantry, F.F., Hangu.*
1906 July 4.	R.	Harris, Col. George Francis Angelo, C.S.I., M.D., F.R.C.P., I.M.S. Inspector-General of Civil Hospitals, Bengal. *Calcutta.*
1908 April 1.	A.	Harrison, Edward Philip, Ph.D. *Europe*
1910 May 4.	N.R.	Harvey, Captain William Frederick, I.M.S. *Pasteur Institute, Kasauli.*
1897 Feb. 3.	R.	*Hayden, Henry Herbert, C.I.E., B.A., B.E., F.A.S.B., F.G.S., Director, Geological Survey of India. *Calcutta.*
1911 June 7.	R.	Hedayat Husain, M., Lecturer, Presidency College. 7-1, *Ramsankar Roy's Lane, Calcutta.*
1907 Nov. 6.	A.	Hepper, Captain Lionel Lees. *Royal Artillery, Europe.*
1908 June 3.	N.R.	Herron, Alexander Macmillan, B.Sc. *Poona.*
1911 April 5.	N.R.	Hiralal, Rai Bahadur, B.A., M.R.A.S., Extra Asst. Commissioner. *Jubbulpore, C.P.*
1908 April 1.	N.R.	Hirst, Captain Frederick Christian. *Indian Army, Shillong.*
1906 Dec. 5.	F.M.	Hirst, Reginald John. C/o Messrs. H. S. King and Co. 9, *Pall Mall, London.*
1891 July 1.	F.M.	*Holland, Sir Thomas Henry, K.C.I.E., D.Sc., A.R.C.S., F.G.S., F.R.S. *Westwood, Alderley Edge, Cheshire, England.*
1908 July 1.	R.	Holmwood, Hon. Mr. Justice Herbert, I.C.S., 22, *Theatre Road, Calcutta.*
1910 Jan. 5.	R.	Hope, Geoffroy D., B.Sc., Ph.D. *Indian Museum, Calcutta.*
1898 Feb. 2.	R.	*Hooper, David, F.C.S., F.L.S., F.A.S.B. 1, *Sudder Street, Calcutta.*
1909 May 5.	N.R.	Horovitz, Josef, Ph.D. *M.A.O. College, Aligarh.*
1901 Dec. 4.	R.	Hossack, William Cardiff, M.D., D.P.H. *Grand Hotel, Calcutta.*
1873 Jan. 2.	L.M.	Houstoun, George L., F.G.S. *Johnstone Castle, Renfrewshire, Scotland.*
1906 May 2.	N.R.	Howell, Evelyn Berkeley, B.A., I.C.S. *Mardan, N.-W.F.P.*
1905 July 5.	N.R.	Humphries, Edgar de Montfort, B.A., I.C.S., Settlement Officer. *Pertabgarh, Oudh.*

Date of Election.		
1908 June 3.	N.R.	Hutchinson, C. M. *Pusa.*
1911 Feb. 1.	R.	Insch, Jas. 89, *Park Street, Calcutta.*
1906 Dec. 5.	N.R.	Jack, James Charles, I.C.S., Settlement Officer. *Faridpur.*
1904 Jan. 6.	N.R.	Jackson, Victor Herbert, M.A. *Patna College, Bankipur.*
1908 Nov. 4.	N.R.	Jacob, Sydney Montague, I.C.S. *C/o Messrs. King King & Co., Bombay.*
1907 Dec. 4.	R.	James, Henry Rosher, M.A., Bengal Education Service. *Principal, Presidency College, Calcutta.*
1905 May 3.	R.	Jayaswal, Kashi Prasad, Bar.-at-Law, High Court. *Calcutta.*
1907 Sept. 25.	N.R.	Jenkins, Owen Francis, I.C.S., Offg. Joint Magistrate. *Budaon, U.P.*
1912 Mar. 6.	R.	Jessop, W. 25, *Chowringhee Road, Calcutta.*
1908 June 3.	R.	Jones, Herbert Cecil, A.R.S.M., A.R.C.S., F.G.S., Asst. Supdt., Geological Survey of India. *Calcutta.*
1911 Sept. 1.	N.R.	Juggarao, Sir Raja Ankitam Venkata. *Zemindar of Shermahamadpuram, Dabagardens, Vizagapatam.*
1911 Nov. 1.	N.R.	Kamaluddin Ahmed, Maulavi. *Supdt., Govt. Madrassa, Chittagong.*
1891 Feb. 4.	N.R.	Kapur, Raja Ban Behari, C.S.I. *Burdwan.*
1911 Jan. 1.	N.R.	Kaye, George Rusby. Registrar, Govt. of India, Dept. of Education. *Simla.*
1910 May 4.	R.	Kemp, Stanley W., B.A., Senior Assistant Superintendent, Indian Museum. *Calcutta.*
1882 Mar. 1.	N.R.	Kennedy, Pringle, M.A., B.L., Vakil. *Mozafferpur.*
1906 Aug. 1.	R.	Kennedy, William Willoughby, M.A., M.D., D.P.H., M.R.S.C., L.R.C.P. 36, *Chowringhee, Calcutta.*
1906 Sept. 19.	R.	Kesteven, Charles Henry, Solicitor to Government. 26, *Dalhousie Square, Calcutta.*
1909 Oct. 6.	R.	Khaliluddin Ahmed, Dr. 36, *Taltolla Lane, Calcutta.*
1909 April 7.	N.R.	Kilner, John Newport, M.B., L.R.C.S., L.R.C.P. *Adra, Manbhum.*
1908 Feb. 5.	N.R.	King, Captain George, M.B., I.M.S. *Midnapur.*
1910 Mar. 2.	R.	Kirkpatrick, W. *Chartered Bank Buildings, Calcutta.*
1904 May 4.	N.R	Knox, Kenneth Neville, I.C.S. *Almora.*
1911 Jan. 4.	N.R.	Koul, Anand. Supdt., Customs and Excise Department. *Srinagar, Kashmir.*

Date of Election.		
1896 July 1.	R.	Küchler, Hon. Mr. George William, C.I.E., M.A., Director of Public Instruction, Bengal. *Calcutta.*
1910 Sept. 7.	N.R.	Kumar, Sahu Ram. *Thakurdware, Moradabad.*
1912 Mar. 6.	N.R.	Lane, Major Clayton, M.D., I.M.S., Civil Surgeon. *Berhampur.*
1887 May 4.	L.M.	Lanman, Charles Rockwell, 9, *Farrar Street, Cambridge, Massachusetts, U.S. America.*
1889 Mar. 6.	L.M.	*La Touche, Thomas Henry Digges, B.A., F.A.S.B., F.G.S. *Alfriston Hills Road, Cambridge, England.* [*Calcutta.*
1911 Feb. 1.	R.	Law, Narendra Nath. 96, *Amherst St.,*
1909 Jan. 6.	R.	Leake, A. Martin, F.R.C.S., V.C. 14, *Garden Reach Road, Calcutta.*
1902 July 2.	N.R.	Leake, Henry Martin, M.A., F.L.S., Economic Botanist to the Government of United Provinces. *Nawabgunj, Cawnpur.*
1909 April 7.	N.R.	Leather, J. Walter, PH.D., Imperial Agricultural Chemist. *Pusa.*
1889 Nov. 6.	R.	Lee, William A., F.R.M.S. 38, *Strand Road, Calcutta.*
1909 Mar. 3.	R.	LeQuesne, Rev. W. R. *London Missionary College, Bhowanipur Road, Calcutta.*
1889 Feb. 6.	N.R.	Little, Charles, M.A. *Patna College, Bankipur.*
1907 Dec. 4.	N.R.	Little, James Henry, Assistant Master, Nawab Bahadur's Institution. *Murshidabad.*
1907 Mar. 6.	A.	Lloyd, Captain Richard Ernest, M.B., B.SC., I.M.S. *Europe.*
1909 Nov. 3.	A.	Löffler, Emanuel Mano. *Europe.*
1911 May 3.	R.	Lomax, C.E., M.A. 11, *Loudon Street, Calcutta.*
1906 Oct. 31.	N.R.	Luard, Captain Charles Eckford, Indian Army, M.A. (Oxon). Resident, *Indore.*
1910 April 6.	N.R.	Ludwig, Eugen. *Gudur.*
1902 July 2.	R.	Luke, James, Journalist. 5, *Camac Street, Calcutta.*
1905 Aug. 2.	N.R.	Lukis, Hon. Surgeon-General Sir Charles Pardey, K.C.S.I. C.S.I., M.B., F.R.C.S., I.M.S. Director-General, Indian Medical Service, *Simla.*
1870 April 7.	L.M.	Lyman, B. Smith. 708, *Locust Street, Philadelphia, U.S. America.*
1905 Aug. 2.	R.	McCay, Captain David, M.B., I.M.S. *Medical College, Calcutta.*
1912 April 3.	R.	MacCabe, Surgeon Capt. Frederik, F. 2, *Outram Street, Calcutta.*
1906 April 4.	A.	Mackenzie, Evan; Church of Scotland. *Europe.*
1912 June 5.	N.R.	Mackie, Capt. Frederick Percival, C/o Post Master. *Gauhati, Assam.*

Date of Election.		
1893 Jan. 11.	L.M.	Maclagan, Hon. Mr. Edward Douglas, M.A., I.C.S. Secretary, Government of India, Revenue and Agriculture Department. *Simla.*
1912 May 1.	R.	McLean, David. 6, *Russell Street, Calcutta.*
1911 April 5.	N.R.	Macmahon, Hon. Sir Arthur Henry, K.C.I.E., G.C.V.O., C.S.I., C.I.E., F.L.S., F.A.S., F.R.G.S., F.Z.S., F.R.A.S., F.S.A. Secretary, Government of India, Foreign Department. *Simla.*
1899 Mar. 1.	N.R.	McMinn, Charles W., B.A., I.C.S. (retired). *Jath Tal, Bhim P.O., Kumaon.*
1891 Feb. 4.	R.	Macpherson, Hon. Mr. Duncan James, M.A., C.I.E., I.C.S. *Chinsurah.*
1911 Aug. 2.	N.R	Macrae, Capt. William, R.E., Govt. Inspector of Railways, No 3 Circle. *Lucknow.*
1912 Mar. 6.	R.	McWatters, Arthur Cecil, I.C.S., Under-Secy., Commerce and Industry Dept. *United Service Club, Calcutta.*
1893 Jan. 11.	L.M.	Madho Rao Scindia, Colonel His Highness Maharajah Sir, *Alijah Bahadur*, G.C.S.I., G.C.V.O., A.D.C., LL.D., Maharajah of Gwalior. *Jai Bilas, Gwalior.*
1906 Dec. 5.	R.	Mahalanobis, Subodh Chandra, B.Sc., F.R.S.E., F.R.M.S. 210, *Cornwallis Street, Calcutta.*
1911 Mar. 1.	R.	Mahatap, Hon. Sir Bijoy Chand, K.C.S.I., Maharajadhiraj of Burdwan. 6, *Alipur Road, Calcutta.*
1898 Nov. 2.	N.R.	Maitra, Akshaya Kumar, B.A., B.L. *Rajshahi.*
1901 July 6.	N.R.	Malyon, Lieut. Frank Hailstone. 21*st Punjabis. Peshawar.*
1901 June 5.	N.R.	Mann, Harold Hart, D.Sc., M.Sc., F.L.S., Principal, Agricultural College. *Poona.*
1899 Aug. 30.	N.R.	Mannu Lal, Rai Bahadur, Civil Surgeon. *Barabanki.*
1905 Dec. 6.	F.M.	Marsden, Edmund, B.A., F.R.G.S. 12, *Elerdale Road, Hampstead, London.*
1911 June 7.	N.R.	Maturin, Lieut. Hugh Geoffrey, 61*st King George's Own Pioneers. United Service Club, Simla.*
1911 Aug. 2.	F.M.	Maulik, Samarendra. *Fitzwilliam Hall, Cambridge, England.*
1892 April 6.	R.	Maynard, Lieut.-Col. Frederic Pinsent, M.B., D.P.H., F.R.C.S., I.M.S., Professor of Ophthalmic Surgery, Medical College. *Calcutta.*
1912 Jan. 10.	N R	Mazumder, Rai Jadunath, Bahadur, Government Pleader. *Jessore.*
1905 Feb. 1.	A.	Megaw, Captain John Wallace Dick, M.B., I.M.S. *Europe.*

Date of Election.		
1886 Mar. 3.	L.M.	Mehta, Rustomjee Dhunjeebhoy, C.I.E. 55, *Canning Street, Calcutta.*
1911 Nov. 1.	R.	Meldrum, Rev. Niel, 2, *Russell St, Calcutta.*
1895 July 3.	F.M.	Melitus, Hon. Mr. Paul Gregory, C.I.E., I.C.S. C/o Messrs. Grindlay & Co., 54, *Parliament Street, London.*
1911 April 5.	N.R.	Meston, Hon. Sir J. S., K.C.S.I., C.S.I., C.S., Government House. *Lucknow.*
1884 Nov. 5	R.	*Middlemiss, Charles Stewart, B.A., F.A.S.B., F.G.S., Superintendent, Geological Survey of India. *Calcutta.*
1905 Dec. 6.	R.	Midhut Mohamed Hossain Khan. 8, *Golam Sobhan's Lane, Calcutta.*
1884 Sept 3.	R.	Miles, William Harry. 7, *Church Lane, Calcutta.*
1904 April 6.	A.	Miller, Sir John Ontario, C.S.I., I.C.S. *Europe.*
1906 Mar. 7.	N.R.	Milsted, Walter Percy Spencer. *Boys' High School, Allahabad.*
1912 June 5.	N.R.	Misra, Champaram, Tahsildar. *Kaiserganj, Bahraich.*
1911 July 5.	N.R.	Misra, Shyam Behari, B.A., I.C.S. Revenue Member, Council of Regency. *Jodhpur.*
1897 Jan. 6.	N.R.	Misra, Tulsi Ram, M.A., Prof., Gurukula Academy. *Hardwar.*
1906 June 6.	R.	Mitra, Kumar Manmatha Nath. 34, *Shampukur Street, Calcutta.*
1910 July 6.	R.	Mohapatra, Srikrishna. 10/1, *St. James's Square.* [*pore.*
1908 Mar. 4.	R.	Moitry, Manmatho Nath, Landholder. *Serampore.*
1908 Mar. 4.	A.	Mollison, James. *Europe.*
1901 Aug. 7.	N.R.	Molony, Edmund Alexander, I.C.S. *Gorakhpur.*
1895 July 3.	N.R.	Monohan, Francis John, I.C.S., *Jalpaiguri.*
1910 Feb. 2.	R.	Monohar Lal, M.A. *Barrackpore.*
1906 Dec. 5.	N.R.	More, Lieut. James Carmichael. 51*st Sikhs.* *U.S. Club, Simla.*
1906 Dec. 5.	N.R.	Morton, Captain Sidney. *24th Punjabis. Bannu, N.-W.F.P.*
1908 Dec. 2.	R.	Moses, Capt. Owen St. John, M.D., F.R.C.S., I.M.S., Resident Physician, Medical College, *Calcutta.*
1909 Mar. 3	R.	Mukherjee, Brajalal, M.A. 9, *Old Post Office Street, Calcutta.*
1909 Jan. 6.	R.	Mukherjee. Govinda Lall. 9, *Old Post Office Street, Calcutta.*
1899 Sept. 29.	R.	Mukherjee, Jotindra Nath, B.A., Solicitor. 3, *Old Post Office Street, Calcutta.*
1911 Feb. 1.	R.	Mukherjee. Manmathanath. Sub-Divisional Officer, Uluberia. *Howrah.*
1900 May 2.	R.	Mukherjee, Phani Bhusan, B.Sc. 57, *Jhowtola Road, Ballygunge, Calcutta.*

Date of Election.		
1910 June 1.	R.	Mukherjee, Pramatha Nath, M.A. 9, *St. James's Square, Calcutta.*
1898 May 4.	R.	Mukherjee. Sir Rajendra Nath, K.C.I.E. 7, *Harington Street, Calcutta.*
1894 Aug. 30.	R.	Mukherjee. Sibnarayan. *Uttarpara, Bally.*
1886 May 5.	L.M.	*Mukhopadhyaya, Hon. Justice Sir Asutosh, Kt., C.S.I., M.A., D.L., D.Sc., F.R.S.E., F.R.A.S., F.A.S.B., Judge, High Court. *Calcutta.*
1908 Feb. 5.	R.	Mukhopadhyaya, Girindra Nath, B.A., M.B. 80, *Russa Road, North, Bhowanipur, Calcutta.*
1892 Dec. 7.	R.	Mukhopadhyaya, Panchanan. 45, *Bechoo Chatterji's Street, Calcutta.*
1909 Mar. 3.	R.	Mullick, Indu Madhab, M.A., M.D. 70, *Harrison Road, Calcutta.*
1901 April 3.	R.	Mullick, Pramatha Nath, Zemindar. 7, *Prasonno Kumar Tagore's Street, Calcutta.*
1906 July 4.	A.	Mulvany, Major John, I.M.S. *Europe.*
1906 Dec. 5.	N R.	Murphy, Captain Charles Cecil Rowe, 30*th Punjabis, Simla.*
1910 Nov. 2.	A.	Murray, William Alfred, B.A. (Cantab), M.B. *Europe.*
1911 Sept. 1.	N.R	Murtaza Hosein Khan, Nawab, Vakil and Zemindar, Katra abu Torabkhan. *Lucknow.*
1908 Sept. 23.	N.R.	Muzaffur Ali Khan Bahadur, Syed, Zemindar and Rais. *Jausath, Dist. Muzaffarnagar.*
1906 Mar. 7.	R.	Nahar, Puran Chand. 28, *Harrison Road, Calcutta.*
1908 Sept. 23.	N.R.	Nande, Lala Jyotiprakas, Zemindar. *Burdwan.*
1904 Dec. 7.	R.	Nathan, Robert, C.S.I., I.C.S. *Calcutta.*
1890 Feb. 5.	N.R.	Nesfield, Capt. Vincent Blumhardt, F.R.C.S., L.R.C.P., I.M.S. Sanitary Commissioner. *Agra.*
1901 Mar. 6.	N.R.	Nevill, Henry Rivers, I.C.S., Editor, District Gazetteers, United Provinces. *Nainital.*
1910 May 4.	R.	Newman, Major Ernest Alan Robert, I.M.S. *General Hospital, Calcutta.*
1889 Aug. 29.	L.M.	Nimmo, John Duncan. *C/o Messrs. Walter Duncan & Co., 137, West George Street, Glasgow.*
1894 June 6.	N.R.	Nomani, Shams-ul-Ulama Maulavi Shibli. *Lucknow.*
1906 Dec. 5.	N.R.	Norman, Henry Campbell, M.A. *Queen's College, Benares.*
1908 Feb. 5.	R.	Nott, Lieut.-Col. Arthur Holbrook, M.D., I.M.S. *Howrah.*
1900 Dec. 5.	F.M.	O'Connor, Major William Frederick Travers, C.I.E., Royal Artillery. *H. B. M.'s Consulate-General, Shiraz, Persia.*

Date of Election.		
1906 Dec. 5.	R.	O'Kinealy, Lieut.-Col. Frederick, M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.S. *General Hospital, Calcutta.*
1905 May 3.	N.R.	Ollenbach, Alfred James, B.A., I.C.S. *Cordite Factory, Aruvankadu P.O., Nilgiris, S. India.*
1905 Nov. 1.	R.	O'Malley, Lewis Sydney Steward, B.A., I.C.S. *United Service Club, Calcutta.*
1906 Aug. 1.	A.	Osburn, Captain Arthur C., M.R.C.S., L.R.C.P. (Lond.), R.A.M.C. *Europe.*
1908 Aug. 5.	N.R.	Owens, Capt. Terence Francis, I.M.S., Chemical Examiner to the Government of Burma. *Rangoon.*
1909 April 7.	N.R.	Ozzard, Lieut-Col. Fairlie Russell, I.M.S. *Jask, Persian Gulf.*
1907 July 3.	A.	Page, William Walter Keightley. *Europe.*
1901 Jan. 2.	N.R.	Pande, Ramavatar, B.A., I.C.S., District Judge. *Mirzapur, U.P.*
1907 Feb. 6.	R.	Panioty, John Emanuel, L.R.C.P. (Lond.), L.R.C.P. & S. (Edin.). 19, *Royd Street, Calcutta.*
1901 Aug. 28.	A.	Panton, Edward Brooks Henderson, B.A., I.C.S. *Europe.*
1904 Aug. 3.	N.R.	Parasnis, Dattalraya Balwant. *Satara.*
1910 April 6.	N.R.	Patuck, Pestonji Sorabji, I.C.S. *Wardha.*
1899 Aug. 2.	R.	Peake, Charles William, M.A., Meteorological Reporter to the Government of Bengal. *Calcutta.*
1906 Dec. 5.	R.	Peart, Captain Charles Lubé. 106*th Hazara Pioneers, Secretary and Member, Board of Examiners, Calcutta.*
1888 June 6.	L.M.	Pennell, Aubray Percival, B.A., Barrister-at-Law. *Rangoon.*
1877 Aug. 1	N.R.	Peters, Lieut.-Col. Charles Thomas, M.B., I.M.S. (retired). *Dinajpur.*
1907 Feb. 6	N.R.	Petrie, David. Criminal Intelligence Office. *Delhi.*
1906 April 4.	R.	Petrocochino, Leonidar. 4, *Clive Ghat Street, Calcutta.*
1889 Nov. 6.	L.M.	*Phillott, Lieut.-Colonel Douglas Craven. PH.D., F.A.S.B. *Indian Army (retired).* C/o Messrs. Grindlay & Co., 54, *Parliament Street, London.*
1904 June 1.	R.	Pilgrim, Guy Ellcock, D.Sc., F.G.S., Assistant Superintendent, Geological Survey of India. *Calcutta.*
1908 Jan. 1.	A.	Pilgrim, Lieut.-Col. Herbert Wilson, M.B., F.R.C.S., I.M.S. *Europe.*
1910 Aug. 3.	R.	Podamraj. 9, *Joygomohan Mullick's Lane, Calcutta.*

Date of Election.		
1910 Feb. 2.	N.R.	Poplai, Sri Ram. *Kabul Gate, Delhi.*
1906 Aug. 1.	N.R	Price, Charles Stanley. *Victoria Boys' School, Kurseong.*
1907 Jan. 2.	A.	Pulley, Lieut. Henry Cuthbert, 12*th Pioneers. Europe.*
1910 Dec. 7.	N.R.	Radha Krishna, *Banker, Chauk, Patna City.*
1880 April 7.	N.R.	Rai. Bepin Chandra. *Giridih, Chota Nagpur.*
1895 Aug. 29.	N.R.	Rai Chaudhuri,Jatindranath, M.A., B.L., Zemindar. *Taki, Jessore.*
1912 June 5.	R.	Rait, Major John W. Forbes, M.B., B.S., I.M.S. *Campbell Hospital, Calcutta.*
1908 Feb. 5.	N.R.	Randle, Herbert Neil, B.A. *Queen's College, Benares.*
1908 July 1.	N.R.	Ranganathasvami, S. P V., *Aryavaraguru, Arshya Library, Vizagapatam.*
1905 Jan. 4.	N.R.	Rankin, James Thomas, I.C.S. *Shillong.*
1907 Aug. 7.	N.R.	Ranking, Lieut. James, Civil Lines, *Meerut, U.P.*
1911 May 3.	N.R.	Rao, T. A. Gopinath, M.A., Supdt. of Archaeology. *Trivandrum.*
1904 Mar. 4.	F.M.	Rapson, E. J. 8, *Mortimer Road, Cambridge.*
1890 Mar. 5.	R.	*Ray, Prafulla Chandra, D.Sc., F A.S.B., Professor, Presidency College. *Calcutta.*
1887 May 4.	R.	Ray, Prasanna Kumar D.Sc. (Lond. and Edin.). 7, *Ballygunge Circular Road, Calcutta.*
1905 May 3.	R.	Richardson, Hon. Mr. Justice Thomas William, I.C.S., Judge, High Court. *Calcutta.*
1908 Feb. 5.	F.M.	Rigo-de-Righie, Alceste Carlo. *C/o* Messrs. Comabé Eckford & Co., Chefoo, Shantung Prov. *North China.*
1910 April 6.	A.	Robertson, A. White, L.R.C.P. *Europe.*
1907 Feb. 6.	A.	Robertson, Major George Alan. 15*th Lancers. Europe.*
1903 Mar. 4.	N.R.	Rogers, Charles Gilbert, F.L.S., F.C.H., Forest Department. *Port Blair, Andamans.*
1900 April 4.	R.	*Rogers, Lt.-Col. Leonard, C.I.E , M.D., B.S., F.R.C P., F.R.C.S., F.A.S.B., I.M.S. *Medical College, Calcutta.*
1901 Dec. 4.	A.	*Ross, Edward Denison, Ph.D., F.A S.B. *Europe.*
1889 June 5.	N.R.	Roy, Maharaja Girjanath. *Dinagepore.*
1903 July 1.	L.M.	Roy, Maharaja Jagadindranath, *Bahadur.* 6, *Lansdowne Road, Calcutta.*
1910 Sept. 7.	N.R	Roy, Kumar Sarat Kumar. *Dayarampur, Rajshahi.* [*Rungpur.*
1909 Nov. 3.	N.R.	Roychaudhury, Mrityunjoy. *Shyampur P.O.,*
1908 June 3.	N.R.	Roychaudhury, Surendra Chandra, Zemindar. *Koondi, Rungpur.*
1906 Feb. 7.	N.R.	Russell, Charles, M.A. *Patna College, Bankipur.*
1908 Feb. 5.	N.R.	Russell, Robert vam, I.C.S., Supdt. of Gazetteer and Ethnography. *Mandla, C.P.*

Date of Election.		
1911 Nov. 1	N.R.	Sahni, Dayaram, M.A., Supdt. of Archaeology. *Srinagar, Kashmir.*
1896 Aug. 27.	R.	Samman, Herbert Frederick, I.C.S. *Magistrate, 24-Parganas, Alipur.*
1910 May 4.	R.	Sandes, Capt. J. D., M.B., I.M.S. *Medical College, Calcutta.*
1906 June 6.	N.R.	Sanial, Surendra Prasad, M.A., F.C.S., Private Secretary to Raja Bahadur. *Majhauli.*
1899 June 7.	N.R.	Sarkar, Chandra Kumar. *Kawkanik, Moulmein.*
1898 Mar. 2.	N.R.	Sarkar, Jadunath. *Patna College, Bankipur.*
1909 Mar. 3.	R.	Sarvadhikari, Hon. Mr. Deva Prasad, M.A., B.L. *Old Post Office Street, Calcutta.*
1911 Jan. 4.	R.	Sarvadhikari, Dr. Suresh Prasad, 79-1, *Amherst St., Calcutta.*
1902 Mar. 5.	R.	Sastri, Rajendra Chandra, *Rai Bahadur*, M.A., Bengali Translator to the Government of Bengal. *Calcutta.*
1902 Feb. 5.	R.	Schulten, Joseph Henry Charles, Ph.D. 4, *Pollock Street, Calcutta.*
1900 Dec. 5.	N.R.	Schwaiger, Imre George, Expert in Indian Art. *Kashmir Gate, Delhi.*
1908 July 1.	N.R.	Seal, Brojendra Nath, M.A. *Victoria College, Cooch Behar.*
1911 June 7.	N.R.	Seconde, Lieut. Emile Charles. 16th *Rajputs, Bareilly, U.P.*
1906 Feb. 7.	R.	Sen, Girindra Kumar. 303, *Bowbazaar Street, Calcutta.*
1902 May 7.	R.	Sen, Jogendra Nath, *Vidyabhusana*, M.A. 31, *Prasanna Kumar Tagore's Street, Calcutta.*
1905 Jan. 4.	R.	Sen, Sukumar. 220, *Lower Circular Road, Calcutta.*
1897 Dec. 1.	R.	Seth, Mesrovb J. 11, *Wellesley Square, Calcutta.*
1911 July 5.	R	Sewell, Capt. Robert Beresford Seymour. M.R.C.S., L.R.C.P., I.M.S. *Indian Museum, Calcutta.*
1907 Aug. 7.	N.R.	Shah Munir Alam, B.A., LL.B. *Mainpura, Ghazipore.*
1909 Jan. 6.	R.	Sharfuddin, Hon. Mr. Justice Syed, Judge, High Court. *Calcutta.*
1906 Dec. 5.	N.R.	Sharp, Henry, C.I.E., M.A., Depy. Secy., Govt. of India, Dept. of Education. *Simla.*
1885 Feb. 4.	L.M.	*Shastri, Mahamahopadhyaya, Haraprasad, C.I.E., M.A., F.A.S.B. 26, *Pataldanga Street, Calcutta.*
1902 Dec. 3.	N.R.	Shastri, Harnarain Goswami. *Hindu College, Delhi.*
1912 Jan. 10.	R.	Shirazi, Maulavi Muhamad Kazim. 23, *Lower Chitpur Road, Calcutta.*

Date of Election.		
1909 Jan. 6.	N.R.	Shirreff, Alexander Grierson, B.A., I.C.S. *Gonda, U.P.*
1908 Mar. 4.	R.	Shujaat Ali, Nasurul Mamalik Mirza, *Khan Bahadur*, Acting Consul-General for Persia. 10, *Hungerford Street, Calcutta.*
1902 Feb. 5.	N.R.	Shyam Lal, Lala, M.A., LL.B., Deputy Collector. *Nawabgung, Cawnpur.*
1899 May 3.	N.R.	Silberrad, Charles Arthur, B.A., B.SC., I.C.S. *Jhansi.*
1909 April 7.	F.M.	Simpson, George Clarke, D.Sc. *C/o Delhi and London Bank, Simla.*
1903 Aug. 26.	N.R.	Simpson, John Hope, I.C.S., Registrar of Co-operative Credit Societies, Upper Provinces. *Gorakhpur.*
1912 Sept. 5.	R.	Singh, Bahadur Sing. 47, *Ripon Street, Calcutta.*
1901 Aug. 7.	R.	Singh, Chandra Narayan, *Rai Bahadur.* 82, *Lansdowne Road, Calcutta.*
1904 Mar. 4.	N.R.	Singh, Kumar Kamlanand. *Srinagar Raj, Srinagar P.O., Purneah District.*
1894 July 4.	N.R.	Singh, Raja Kushal Pal, M.A. *Narki.*
1895 Aug. 29.	R.	Singh, Lachmi Narayan, M.A., B.L., Pleader, High Court. *Calcutta.*
1912 May 1.	R.	Singh Ray, Lalit Mohan, Rai Bahadur. 4, *Creek Row, Calcutta.*
1893 Mar. 1.	N.R.	Singh, Maharaja Kumara Sirdar Bharat, I.C.S. (retired). *Shankergur, Allahabad.*
1892 Mar. 2.	L.M.	Singh, Raja Ooday Pratab, C.S.I., Raja of Bhinga. *Bhinga.*
1899 Aug. 29.	N.R.	Singh, H.H. The Maharaja Sir Prabhu Narain, *Bahadur*, G.C.I.E., Maharaja of Benares. *Ramnagar Fort, Benares.*
1909 April 7.	N.R.	Singh, Raja Prithwipal. Talukdar of Surajpur, District Barabanki. *Oudh.*
1889 Nov. 6.	N.R.	Singh, H.H. The Hon. Maharaja Sir Rameshwara, *Bahadur*, K.C.I.E. *Durbhanga.*
1912 Mar. 6.	R	Singh, Maharaja Ranjit, of Nasirpur. 58. *Chowringhee Road, Calcutta.*
1894 Feb 7.	N.R.	Singh, H.H. The Maharaja Vishwa Nath *Bahadur. Chhatturpur, Bundelkhund.*
1897 Jan. 6.	R.	Sircar, Amrita Lal, F.C.S., L.M.S. 51, *Sankaritolla Lane, Calcutta.*
1898 Aug. 3.	N.R.	Sita Ram, B.A., Depy. Magistrate. *Allahabad*
1909 July 7.	A.	Smith, Capt. H. Emslie, I.M.S. *Europe.*
1907 Dec. 4.	N.R.	Smith, Lieut.-Col. John Manners, Indian Army, V.C., C.I.E. *Resident, Nepal.*
1911 Mar. 1.	A.	Smith, Major O. A. 27th *Punjabis. Europe.*
1907 Mar. 6.	N.R.	Sofiulla Saifududdin Ahmed, Maulavi, Inspector of Excise. *Silchar.*
1909 Feb. 3.	A.	Sommerfeldt, Prof. E. *Europe.*

Date of Election.		
1912 Jan. 10	R.	Southwell, T., Fishery Dept. *Writers' Buildings.*
1901 Dec. 4.	N.R.	Spooner, David Brainerd, PH.D., Archæological Surveyor. *Bankipore.*
1912 May 1.	R.	Stadler. George L. Cousul for Belgium. 37, *Chowringhee Road, Calcutta.*
1912 Oct 30.	N.R	Stallard, Dr. Philip Lechmen, District Surgeon. *G.I.P. Railway, Jhansi.*
1909 April 7.	A.	Stanley, Sir John, KT., K.C.I.E , K.C. *Europe.*
1904 Sept. 28.	N.R.	Stapleton, Henry Ernest, B.A., B.Sc. *Dacca.*
1908 Dec. 2.	A	Steen, Capt. Hugh Barkley, M.B., I.M.S. *Europe.*
1904 June 1.	R	Stephen, Hon. Mr. Justice Harry Lushington, Judge, High Court. *Calcutta.*
1899 Aug. 30.	R.	Stephen, St. John, B.A., LL.B., Barrister-at-Law. 7, *Russell Street, Calcutta.*
1900 Aug. 29.	N.R.	Stephenson, Major John, I.M.S. *Lahore.*
1907 Dec. 4	R.	Stevens, Major C. R., I.M.S. *Medical College, Calcutta.*
1907 June 5.	N.R.	Stewart, Capt. Francis Hugh, I.M.S. *Bombay.*
1906 Dec. 5.	F.M.	Stokes, Captain Claude Bayfield, Military Attaché. *Teheran, Persia.*
1911 Feb. 1.	R.	Stonebridge, Arthur W., Chief Engineer, Messrs. Burn & Co., 7, *Hastings St., Calcutta.*
1907 Aug. 7	N.R	Subramania Iyer, Valavanur, Extra Asst. Conversator of Forests. *Coimbatore.*
1907 June 5.	R.	Suhrawardy, Abdulla al-Mamun, M.A., D.Litt., LL.D., Barrister-at-Law. 34, *Elliott Road, Calcutta.*
1907 June 5.	N.R	Swinhoe. Rodway Charles John, Solicitor. *Mandalay, Upper Burma.*
1909 Jan. 6.	R.	Tagore, Kshitindranath, B.A. *Howrah.*
1898 April 6.	R.	Tagore, Hon. Maharaja Sir Prodyat Coomar, *Bahadur*, KT. *Pathuriaghatta, Calcutta.*
1906 Mar. 7.	R.	Tagore, Kumar Shyama Kumar, Zemindar. 65, *Pathuriaghutta Street, Calcutta.*
1904 July 6.	N.R.	Talbot, Walter Stanley, I.C.S., Revenue Commissioner. *Jammu.*
1910 Aug. 3.	N.R	Tancock, Capt. Alexander Charles. 31*st Punjabis. Nowshera, N.-W.F.P.*
1893 Aug. 31.	N.R.	Tate, George Passman, Assistant Superintendent, Survey of India. *Moossoorie.*
1909 Jan. 6.	N.R	Taylor, Charles Somers, B.Sc. *Bhagalpur.*
1910 April 6.	N.R.	Teesdale, Capt. Frank Robinson. 25*th Cavalry F.F. Risalpur.*
1906 Dec. 5.	N.R.	Tek Chand. Dewan, B.A., M.R.A.S., I.C.S., Deputy Commissioner. *Gujranwala, Punjab.*
1878 June 5.	N.R.	Temple, Colonel Sir Richard Carnac, Bart., Indian Army, C.I E. *C/o Messrs. King, King & Co., Bombay.*

Date of Election.		
1904 May 4.	N.R.	Thanawala, Framjee Jamasjee. 90, *Cawasjee Patel Street, Fort, Bombay.*
1875 June 2.	R.	*Thibaut, G., Ph.D., C.I.E., F.A.S.B. 18, *Royd Street, Calcutta.*
1911 Mar. 1.	F.M.	Thomas, F. W., Librarian, India Office. *London.*
1909 Aug. 4.	N.R	Thompson, John Perronet, M.A., I.C.S. *Lahore.*
1908 Nov. 4.	N.R.	Thornely, Capt. Michael Harris, I.M.S. *Arrah.*
1898 Nov. 2.	R.	Thornton, Edward, F.R.I.B.A. 6, *Clive Street, Calcutta.*
1911 Mar. 1.	A	Thorpe, Godfrey Francis. Bengal Pilot Service. *Europe.*
1911 July 5.	N.R	Thurston, Capt. Edward Owen, I.M.S., B.S., F.R.C.S. *Burdwan.*
1904 June 1.	N R	Tipper, George Howlett, M.A., F.G.S., Assistant Superintendent, Geological Survey of India. *Karachi.*
1912 Nov. 6.	R.	Tomkins, H. G., C.I.E., F.R.A.S. 9, *Riverside, Barrackpur.*
1909 Dec. 1.	R.	Toth, Eugene. 13, *Sudder Street, Calcutta.*
1910 Dec. 7.	N.R.	Towle, J.H, Principal. M.A.O. College, *Aligarh.*
1907 Feb. 6.	N.R.	*Travers, Morris William, D.Sc., F.R.S., F.A.S.B., Director of Indian Institute of Science. *Bangalore.*
1861 June 5.	L.M.	Tremlett, James Dyer, M.A., I.C.S. (retired). *Dedham, Essex, England.*
1900 Aug. 29.	N.R.	Vaughan, Lieut.-Col. Joseph Charles Stoelke, I.M.S. *Bhagalpur.*
1890 Feb. 5.	N.R.	*Venis, Arthur, M.A., D.Litt., C.I.E., F.A.S.B. *Benares.* [*Simla.*
1909 May 5.	N.R.	Venkayya, V., Govt. Epigraphist in India.
1902 June 4.	R.	*Vidyabhusana, Mahamahopadhyaya Satis Chandra. M.A., Ph.D. F.A.S.B. 26/1, *Kanay Lal Dhur's Lane, Calcutta.*
1901 Mar. 6.	N.R.	Vogel, Jean Philippe. Litt.D. Archaeological Surveyor. *Punjab Circle, Lahore.*
1894 Sept. 27.	L.M.	Vost, Lieut.-Col. William, I.M.S., Civil Surgeon. *Saharanpore.*
1902 Oct. 29.	R	Vredenburg, Ernest, B.L., B.Sc., A.R.S.M., A.R.C.S., F G.S. 27, *Chowringhee Road.*
1909 Jan. 6.	N.R.	*Walker, Gilbert Thomas, D.Sc., F.R.S., F.A.S.B., Director-General of Observatories. *Simla.*
1907 July 3	R.	Walker, Harold. A.R.C.S., F.G.S., A.M.Inst.M. Assistant Superintendent, Geological Survey of India. *Calcutta.*
1900 Jan. 19.	A.	Wallace, David Robb. *Europe.*
1901 June 5.	N.R.	Walsh, Ernest Herbert Cooper, C.S.I., I.C.S., Commissioner, Bhagalpur Division. *Bhagalpur.*

Date of Election.		
1909 July 7.	R.	Waters, Major Ernest Edwin, I.M.S. *Chinsurah.*
1911 Feb. 1.	A.	Waters, Dr. Harry George, F.R.I.P.H. *Europe.*
1905 Dec. 6.	N.R.	Watson, Edwin Roy, M.A., B.Sc. *Dacca.*
1912 Mar. 6.	R.	Watt, Rev. J., Principal, Scottish Churches College. 4, *Cornwallis Street, Calcutta.*
1910 Sept. 7.	R.	Watts, H. P., B.A. (Cantab). 11, *Loudon Street, Calcutta.*
1909 Dec. 1.	N.R.	Webster, J. E., I.C.S. *Kohima, Naga Hills, Assam.*
1907 April 3.	R.	White, Lieut. Arthur Denham, M.B., B.S. (Lond.), I.M.S. *General Hospital, Calcutta.*
1907 Feb. 6.	N.R.	White, Captain J. R., D.S.O., *Gordon Highlanders. Secunderabad*
1906 Sept. 19.	A.	Whitehead, Richard Bertram, I.C.S., *Europe.*
1909 April 7.	N.R.	Wilkinson, Major Edmund, I.M.S., L.R.C.S., D. Litt., Sanitary Commissioner, *Punjab, Lahore.*
1910 April 6.	N.R.	Williams, Garfield Hodder, M.B., B.S. (Lond.), M.R.C.S., L.R.C.P. *St. John's College, Agra.*
1911 July 5.	N.R.	Williams, Major Henry John, King's Dragoon Guard, *Umbala, Punjab.*
1909 Mar. 3.	F.M.	Wilson, J. R. R., M.I.C.E., F.G.S. H.M. Inspector of Mines, *Woodlands, Westwood Lane, Leeds, England.*
1910 Dec. 7.	R.	Windsor, Major Frank Needham, I.M.S. *Medical College, Calcutta.*
1904 Mar. 4.	R.	Wood, William Henry Arden, M.A., F.C.S., F.R.G.S., Principal, La Martinière. 11, *Loudon Street, Calcutta.*
1909 April 7.	A.	Woodhouse, E. J., B.A. *Europe.*
1906 July 4.	A.	Woodley, Rev. Edward Carruthers. M.A. *Europe*
1912 Mar. 6.	R.	Woodroffe, Hon. Mr. Justice John George. 13, *Alexandra Court, Calcutta.*
1906 Mar. 7.	N.R.	Woolner, Alfred Cooper, M.A., Principal, Oriental College. *Lahore.*
1908 April 1.	R.	Wordsworth, William Christopher. Asst. Director of Public Instruction, Bengal. *Writers' Buildings, Calcutta.*
1907 June 5.	R.	Wright, Harold, A.M.I.C.E. *E.I.R. House, Calcutta.*
1894 Aug. 30.	N.R.	Wright, Henry Nelson, B.A., I.C.S., *District Judge, Bareilly.*
1905 Mar. 1.	R.	Young, Rev. Arthur Willifer. 23, *Chowringhee, Calcutta.*
1911 Aug. 2.	A.	Young, Gerald Mackworth, B.A., I.C.S. *Europe.*
1906 June 6.	N.R.	Young, Mansel Charles Gambier. *Dhanbaid.*
1910 April 6.	N.R.	Young, Capt. Thomas Charles McCombie, M.B., I.M.S. *Dacca.*

SPECIAL HONORARY CENTENARY MEMBERS.

Date of Election.	
1884 Jan. 15.	Dr. Ernst Haeckel, Professor in the University of Jena. *Prussia.*
1884 Jan. 15.	Revd. Professor A. H. Sayce, Professor of Assyriology, Queen's College. *Oxford, England.*
1884 Jan. 15.	Monsieur Émile Senart. 18, *Rue François Ier, Paris, France.*

HONORARY FELLOWS.

Date of Election.	
1879 June 4.	Dr. Albert Günther, M.A., M.D., Ph.D., F.Z.S., F.R.S. 23, *Lichfield Road, Kew, Surrey, England.*
1879 June 4.	Dr. Jules Janssen. *Observataire d'Astronomie Physique de Paris, France.*
1883 Feb. 7.	Dr. Alfred Russell Wallace, LL.D., D.C.L., F.L.S., F.Z.S., F.R.S. *Curfe View, Parkstone, Dorset, England.*
1894 Mar. 7.	Professor Theodor Noeldeke. *C/o Mr. Karl T. Trübner, Strassburg, Germany.*
1895 June 5.	Lord Rayleigh, M.A., D.C.L., D.Sc., LL.D., Ph.D., F.R.A.S., F.R.S. *Ferling Place, Witham, Essex, England.*
1895 June 5.	Charles H. Tawney, Esq., M.A., C.I.E. *C/o India Office, London.*
1896 Feb. 5.	Professor Charles Rockwell Lanman. 9, *Farrar Street, Cambridge, Massachusetts, U.S. America.*
1899 Feb. 1.	Dr. Augustus Frederick Rudolf Hœrnle, Ph.D., C.I.E. 8, *Northmoor Road, Oxford, England.*
1899 Dec. 6.	Professor Edwin Ray Lankester, M.A., LL.D., F.R.S., *British Museum* (*Nat. Hist.*), *Cromwell Road, London, S.W.*
1899 Dec. 6.	Professor Edward Burnett Tylor, D.C.L., LL.D., F.R.S., Keeper, University Museum. *Oxford, England.*
1899 Dec. 6.	Professor Edward Suess, Ph.D., Professor of Geology in the University of Vienna.
1901 Mar. 6.	Professor John Wesley Judd, C.B., LL.D., F.R.S., F.G.S., Late Prof. of the Royal College of Science. 30, *Cumberland Road, Kew, England.*
1902 Nov. 5.	Monsieur René Zeiller. *Ingénieur en chef des Mines. École superieur des Mines, Paris.*
1904 Mar. 2.	Professor Hendrick Kern. *Utrecht, Holland.*
1904 Mar. 2.	Professor Sir Ramkrishna Gopal Bhandarkar, K.C.I.E., *Poona.*
1904 Mar. 2.	Professor Ignaz Goldziher, Ph.D., D.Litt., LL.D. *Budapest, Hungary.*
1904 Mar. 2.	Sir Charles Lyall, M.A., K.C.S.I., C.I.E., LL.D. 82, *Cornwall Gardens, London, S.W.*

Date of Election.	
1904 Mar. 2.	Sir William Ramsay, Ph.D. (Tüb.), LL.D., Sc.D. (Dubl.), F.C.S., F.I.C. *University College, Gower Street, London, W.C.*
1904 July 2.	Dr. George Abraham Grierson, Ph.D., D.Litt., C.I.E., I.C.S. (retired). *Rothfarnham, Camberley, Surrey, England.*
1906 Mar. 7.	The Right Hon'ble Baron Curzon of Kedleston, M.A., D.C.L., F.R.S. 1, *Carlton House Terrace, London, S.W.*
1908 July 1.	Lt.-Col. Henry Haversham Godwin-Austen, F.R.S., F.Z.S., F.R.G.S. *Nora Godalming, Surrey, England.*
1908 July 1.	Dr. H. Oldenberg. The University, Gottingen. *Germany.*
1911 Sept. 6.	Lieut.-Col. Alfred William Alcock, I.M.S., C.I.E., M.B., LL.D., C.M.Z.S., F.R.S. *Heathlands, Erith Road, Belvedere, Kent, England.*
1911 Sept. 6.	Prof. Edward George Browne, M.A., M.B., M.R.C.S., L.R.C.P., M.R.A.S. *Pembroke College, Cambridge.*
1911 Sept. 6.	Dr. A. Engler, Prof. of Systematic Botany, University of Berlin, *Prussia.*
1911 Sept. 6.	Sir Clements Markham, K.C.B., F.R.S., D.Sc. 21, *Eccleston Square, London, S.W.*
1911 Sept. 6.	Mahamahopadhyaya Kamakhyanath Tarkavagisa. 111-4, *Shambazar Street, Calcutta.*

FELLOWS.

Date of Election.	
1910 Feb. 2.	Dr. N. Annandale, D.Sc., C.M.Z.S., F.L.S.
1910 Feb. 2.	The Hon'ble Justice Sir Asutosh Mukhopadhyaya, Kt., C.S.I., M.A., D.L., D.Sc., F.R.A.S., F.R.S.E.
1910 Feb. 2.	I. H. Burkill, Esq., M.A., F.L.S.
1910 Feb. 2.	Mahamahopadhyaya Haraprasad Sashtri, C.I.E., M.A.
1910 Feb. 2.	Sir Thomas Holland, K.C.I.E., D.Sc., A.R.C.S., F.G.S., F.R.S
1910 Feb. 2.	D. Hooper, Esq., F.C.S.
1910 Feb. 2.	T. H. D. LaTouche, Esq., B.A., F.G.S.
1910 Feb. 2.	Babu Monmohan Chakravarti, M.A , B.L.
1910 Feb. 2.	Lieut.-Colonel D. C. Phillott, Indian Army.
1910 Feb. 2.	Dr. Prafulla Chandra Ray. D.Sc.
1910 Feb. 2.	Major L. Rogers, C.I.E., M.D., B.S., F.R.C.P., F.R.C.S., [I.M.S.
1910 Feb. 2.	Dr. E. D. Ross, Ph.D.
1910 Feb. 2.	Mahamahopadhyaya Satis Chandra Vidyabhusana, M.A., Ph.D., M.R.A.S.
1910 Feb. 2.	Dr. G. Thibaut, Ph.D., C.I.E.
1910 Feb. 2.	Dr. M. W. Travers, D.Sc., F.R.S.
1910 Feb. 2.	A. Venis, Esq., M.A.
1910 Feb 2.	Dr. G. T. Walker, C.S.I., M.A., F.R.S.
1911 Feb. 1.	E. A. Gait, Esq., C.I.E., I.C.S.

Date of Election.	
1911 Feb. 1.	H. H. Hayden, Esq., C.I.E., B.A., B.E., F.C.S.
1912 Feb. 5.	H. Beveridge, Esq., I.C.S. (retired).
1912 Feb. 5.	J. C. Bose, Esq., C.S.I., C.I.E., M.A., D.Sc.
1912 Feb. 5.	Prof. P. J. Bruhl, F.C.S.
1912 Feb. 5.	Capt. S. R. Christophers, I.M.S.
1912 Feb. 5.	Charles Stewart Middlemiss, Esq., B.A., F.G.S.

ASSOCIATE MEMBERS.

Date of Election.	
1875 Dec. 1.	Revd. J. D. Bate. 15, *St. John's Church Road, Folkstone, Kent, England.*
1882 June 7.	Herbert Giles, Esq. *Europe.*
1885 Dec. 2.	Dr. A. Führer. *Europe.*
1886 Dec. 1.	Sarat Chandra Das, Rai Bahadur, C.I.E. 32, *Creek Row, Calcutta.*
1899 April 5.	Pandit Visnu Prasad Raj Bhandari. Chief Librarian, Bir Library. *Katmandu, Nepal.*
1899 Nov. 1.	Revd. E. Francotte, S.J. 30, *Park Street, Calcutta.*
1902 June 4.	Revd. A. H. Francke. *Niesky Ober-Lausitz, Germany.*
1908 July 1.	Babu Dinesh Chandra Sen. 19, *Kantapuker Lane, Calcutta.*
1908 July 1.	Revd. Father J. Hoffmann, S.J. *Mauresa House, Ranchi.*
1909 Mar. 3.	Rai Balkrishna Atmaram Gupte, Bahadur. *Indian Museum, Calcutta.*
1910 Sept. 7.	Shamsul Ulama Maulvi Ahmad Abdul Aziz. *Azeez Bag, City-Hyderabad, Deccan.*
1910 Sept. 7.	L. K. Anantha Krishna Iyer, Esq. *Thichur.*
1910 Dec. 7.	The Rev. H. Hosten, S.J. 30, *Park Street, Calcutta.*

LIST OF MEMBERS WHO HAVE BEEN ABSENT FROM INDIA THREE YEARS AND UPWARDS.*

* *Rule* 40.—After the lapse of three years from the date of a member leaving India, if no intimation of his wishes shall in the interval have been received by the Society, his name shall be removed from the List of Members.

The following members will be removed from the next Member List of the Society under the operation of the above Rule:—

J. A. Anderson, Esq.
Rev. Evan Mackenzie.

Capt. Arthur C. Osburn, R.A.M.C.
Major George Alan Robertson, 15th Lancers.
Prof. E. Sommerfedt.

LOSS OF MEMBERS DURING 1912.

By Retirement.

Brajendra Nath De, Esq., M.A., I.C.S. (retired).
William Ferrall Bolton, Esq.
The Most Revd. Dr. Reginald Stephen Copleston, D.D.
Major H. W. Gratten, R.A.M.C.
J. C. R. Johnston, Esq.
A. H. Lewis, Esq.
Major Victor Edward Hugh Lindesay, M.B., I.M.S.
James Hamilton Lindsay, Esq., M.A., I.C.S.
Capt. A. E. J. Lister, I.M.S.
Major Ralph Henry Maddox, I.M.S.
John Hubert Marshall, Esq., M.A.
William Stanley Milne, Esq., I.C.S.
Capt. John George Patrick Murray, I.M.S.
Mir Nasir Ali Khan Bahadur.
S. Nasir Hosein Khan.
The Hon Mr. Charles Evelyn Arbuthnot William Oldham, I.C.S.
Dr. D. Quinlan.
Rev. Arthur Cyril Ridsdale.
H. A. Rose, Esq., I.C.S.
Major G. M. Routh. R.A.
Capt. H. Stewart, I.A.
Capt. John Johnson Urwin, M.B., I.M.S.
Capt. Herbert James Walton, M.B.
S. C. Williams, Esq., B.A.

By Death.

Ordinary Members.

Maharaja Sri Ram Chandra Bhanj Deb.
W. H. Buchan, Esq., I.C.S.
Babu Noinchand Bural.
Babu Mahendra Nath De., M.A.
Raja Binoy Krishna Deb.
Babu Girish Chandra Ghosh.
Eyre Loftus Preston, Esq.

Life Member.

Pandit Mohanlal Vishnulal Pandia, F.T.S.

Honorary Fellow.

Lord Lister, F.R.C.S., D.C.L, M.D., LL.D., D.SC., F.R.S.

Associate Member.

F. Moore, Esq., F.L.S

UNDER RULE 40.

Percy Bramley, Esq.
Albert Pendrill Charles, Esq., I.C.S.
Dr. Olin Eakins, M.D.
Sir Andrew Henderson Leith Fraser, K.C.S.I.
Benjamin Grey Horniman, Esq.
Arthur William Pim, Esq., I.C.S.
E. P. Stebbing, Esq., F.Z.S.
Dr. G. Orissa Taylor.

ELLIOTT GOLD MEDAL

RECIPIENTS.

1893 Chandra Kanta Basu.
1895 Yati Bhusana Bhaduri, M.A.
1896 Jnan Saran Chakravarti, M.A.
1897 Sarasi Lal Sarkar, M.A.
1901 Sarasi Lal Sarkar, M.A.
1904 { Sarasi Lal Sarkar, M A.
Surendra Nath Maitra, M.A.
1907 Akshoyakumar Mazumder.
1911 { Jitendra Nath Rakshit.
Jatindra Mohan Datta.

BARCLAY MEMORIAL MEDAL.

RECIPIENTS.

1901 E. Ernest Green, Esq.
1903 Major Ronald Ross. F.R.C.S., C.B., C.I.E., F.R.S., I.M.S. (retired).
1905 Lieut.-Colonel D. D. Cunningham, F.R.S., C.I.E., I.M.S. (retired).
1907 Lieut.-Colonel Alfred William Alcock, M.B., LL.D., C.I.E., F.R.S.
1909 Lieut.-Colonel David Prain, M.A., M.B., LL.D., F.R.S., I.M.S. (retired).
1911 Dr. Karl Diener.

[APPENDIX.]

ABSTRACT STATEMENTS

OF

RECEIPTS AND DISBURSEMENTS

OF THE

ASIATIC SOCIETY OF BENGAL

FOR

THE YEAR 1912.

STATEMENT

1912. *Asiatic Society*

Dr.

To Establishment.

			Rs.	As.	P.	Rs.	As.	P.
Salaries			6,713	15	3			
Do. (Officer in charge for Researches in History, Religion, Ethnology and Folklore in Bengal)			3,600	0	0			
Commission			611	0	3			
Pension			420	0	0			
						11,344	15	6

To Contingencies.

Stationery			204	13	6			
Taxes			1,502	8	0			
Postages			831	1	0			
Freight			329	12	4			
Auditing			100	0	0			
Lights and Fans			1,070	12	0			
Insurance fee			343	12	0			
Repairs			1,930	0	0			
Petty Repairs			197	15	0			
Typewriters			279	0	0			
Miscellaneous			615	9	2			
						7,405	3	0

To Library and Collection.

Books			1,182	3	7			
Binding			1,404	9	0			
Purchase of Manuscripts			111	0	0			
						2,697	12	7

To Publications.

"Journal and Proceedings" and "Memoirs"			9,830	11	9			
To printing charges of Circulars, etc. ...			248	0	0			
						10,078	11	9
„ Personal Account (written off and miscellaneous) ...						452	5	0

To Extraordinary Expenditure.

Royal Society's Scientific Catalogue			2,598	13	6			
Balance			2,32,334	7	8			
Total Rs. ...			2,66,912	5	0			

No. 1.

of Bengal. *1912.*

Cr.

		Rs. As. P.	Rs. As. P.
By Balance from last Report			2,32,014 1 4
By Cash Receipts.			
Publications sold for cash		1,070 6 7	
Interest on Investments		8,320 8 0	
Rent of room in the Society's premises ...		650 0 0	
Allowance from Government of Bengal for the publication of papers on Anthropological and Cognate subjects		2,000 0 0	
Do. do. Chief Commissioner of Assam do. do. ...		1,000 0 0	
Do. do. Government of Bengal for Researches in History, Religion, Ethnology, and Folklore in Bengal ...		3,600 0 0	
Loan		1,500 0 0	
Miscellaneous		271 3 11	
			18,412 2 6
By Extraordinary Receipts.			
Subscriptions to Royal Society's Scientific Catalogue			352 2 0
By Personal Account.			
Admission fees		1,184 0 0	
Members' subscription		11,335 0 0	
Compound subscription		200 0 0	
Subscriptions for Society's "Journal and Proceedings" and "Memoirs"... ...		1,560 0 0	
Sales on credit		1,843 5 3	
Miscellaneous		11 9 11	
			16.133 15 2
Total Rs. ...			2,66,912 5 0

D. Hooper,

Honorary Treasurer,
Asiatic Society of Bengal.

STATEMENT

1912. Oriental Publication Fund, No. 1, in

Dr.

To Cash Expenditure.

				Rs.	As.	P.	Rs.	As.	P.
Salaries ...	...	...	...	1,735	4	3			
Commission	...	...	...	68	1	4			
Postage ...	...		...	288	2	0			
Editing charges	...	...	...	3,413	12	0			
Contingencies	...	...	...	57	1	9			
Printing charges	...	...	...	6,722	9	0			
Stationery	...	...	...	6	14	6			
Freight ...	...	...	...	126	7	5			
Lights and Fans	...	...	...	48	8	0			
				12,466	12	3			
To Personal Account (written off and miscellaneous) ...	...	...	...	59	2	0			
	Balance	...	...	3,193	5	5			
	Total Rs.	...		15,719	3	8			

STATEMENT

1912. Oriental Publication Fund, No. 2, in

Dr.

To Cash Expenditure.

				Rs.	As.	P
Printing charges ...	...	...	...	7,074	3	0
	Balance	...	...	625	3	0
	Total Rs.	...		7,699	6	0

No. 2.

Acct. with the Asiatic Soc. of Bengal. 1912.

Cr.

			Rs.	As.	P.	Rs.	As.	P.
By Balance from last Report ...	...	...				2,488	13	7
By Cash Receipts.								
Government Allowances ...	...		9,000	0	0			
Publications sold for cash ...	..		1,415	2	6			
Advances recovered ...	...		105	9	7			
						10,520	12	1
By Personal Account.								
Sales on credit ...	...	...	...	...		2,709	10	0
Total Rs. ...						15,719	3	8

D. Hooper,
Honorary Treasurer,
Asiatic Society of Bengal.

No. 3.

Acct. with the Asiatic Soc. of Bengal. 1912.

Cr.

			Rs.	As.	P.
By Balance from last Report ...	...	...	6,699	6	0
By Cash Receipts.					
Government Allowance ...	...	...	1,000	0	0
Total Rs. ...			7,699	6	0

D. Hooper,
Honorary Treasurer,
Asiatic Society of Bengal.

STATEMENT

1912. Oriental Publication Fund, No. 3, in

Dr.

To Cash Expenditure.

	Rs.	As.	P.
To Balance	1,198	9	6
Total Rs.	1,198	9	6

STATEMENT

1912. Sanskrit Manuscript Fund in Acct.

Dr.

To Cash Expenditure.

	Rs.	As.	P.	Rs.	As.	P.
Salaries	1,536	12	6			
Bonus	37	8	0			
Contingencies	119	12	6			
Insurance	125	0	0			
Stationery	14	7	0			
Purchase of Manuscripts	219	0	0			
Postages	3	7	6			
				2,055	15	6
Balance	2,394	4	8			
Total Rs. ...	4,450	4	2			

No. 4.

Acct. with the Asiatic Soc. of Bengal. 1912.

Cr.

			Rs. As. P.
By Balance from last Report	...	... ...	1,198 9 6
TOTAL Rs.	...	...	1,198 9 6

D. HOOPER,
Honorary Treasurer,
Asiatic Society of Bengal.

No. 5.

with the Asiatic Society of Bengal. 1912.

Cr.

			Rs. As. P.	Rs. As. P.
By Balance from last Report	...	...	...	1,195 13 11
BY CASH RECEIPTS.				
Government Allowance	...	...	3,200 0 0	
Publications sold for cash	...	...	15 8 0	
Advances recovered ...	...	...	1 7 0	
				3,216 15 0
BY PERSONAL ACCOUNT.				
Sales on credit	...	... ...		37 7 3
TOTAL Rs.	...			4,450 4 2

D. HOOPER,
Honorary Treasurer,
Asiatic Society of Bengal.

STATEMENT

1912. Arabic and Persian MSS. Fund in

Dr.

To Cash Expenditure.

			Rs.	As.	P.	Rs.	As.	P.
Salaries ...	...	...	2,193	3	6			
Bonus ...	...	...	5	0	0			
Contingencies	...	...	5	10	0			
Insurance ...	...	...	31	4	0			
Stationery ...	...	...	1	12	0			
Postages ...	...	...	1	3	6			
Loan refunded	...	...	1,500	0	0			
						3,738	1	0
	Balance	...	...			1,230	2	8
	Total Rs.	...				4,968	3	8

STATEMENT

1912. Bardic Chronicles MSS. Fund in

Dr.

To Cash Expenditure.

			Rs.	As.	P.	Rs.	As.	P.
Travelling charges	...	...	...			867	5	0
	Balance	...	...			280	10	6
	Total Rs	...				1,153	15	6

No. 6.

Acct. with the Asiatic Soc. of Bengal. 1912.

Cr.

	Rs. As. P.	Rs. As. P.
By Balance from last Report		634 14 4
By Cash Receipts.		
Government Allowance		4,333 5 4
Total Rs. ...		4,968 3 8

D. Hooper,
Honorary Treasurer,
Asiatic Society of Bengal.

No. 7.

Acct. with the Asiatic Soc. of Bengal. 1912.

Cr.

	Rs. As. P.	Rs. As. P.
By Balance from last Report		1,153 15 6
Total Rs. ..		1,153 15 6

D Hooper.
Honorary Treasurer,
Asiatic Society of Bengal.

STATEMENT

1912. *Personal*

Dr.

	Rs.	As.	P.	Rs.	As.	P.
To Balance from last Report				5,212	13	3
To Cash Expenditure.						
Advances for purchase of Manuscripts, etc ...	...			1,053	0	4
To Asiatic Society	16,133	15	2			
,, Oriental Publication Fund, No. 1 ...	2,709	10	0			
,, Sanskrit Manuscript Fund	37	7	3			
				18,881	0	5
TOTAL Rs. ..				25,146	14	0

STATEMENT

1912. *Invest-*

Dr.

	Value. Rs.	As.	P.	Cost. Rs.	As.	P.
To Balance from last Report	2,38,700	0	0	2,35,951	0	10
TOTAL Rs. ...	2,38,700	0	0	2,35,951	0	10

FUNDS.	PERMANENT RESERVE. Value. Rs.	A.	P.	Cost. Rs.	A.	P.	TEMPORARY RESERVE. Value. Rs	A.	P	Cost. Rs.	A.	P.	Total Cost. Rs.	A.	P.
Asiatic Society ...	1,63,350	0	0	1,62,035	9	8	73,950	0	0	72,576	1	2	2,34,611	10	10
Trust Fund ...	1,400	0	0	1,339	6	0	...	...	...	...	...	..	1,339	6	0
TOTAL Rs. ...	1,64,750	0	0	1,63,374	15	8	73,950	0	0	72,576	1	2	2,35,951	0	10

No. 8.

Account. *1912*

Cr.

		Rs.	As.	P.	Rs.	As.	P.
By Cash Receipts	...	...			19,421	12	5
,, Asiatic Society	...	452	5	0			
,, Oriental Publication Fund, No. 1	...	59	2	0			
					511	7	0

By Balance.	Due to the Society.			Due by the Society.		
	Rs.	As.	P.	Rs.	As.	P.
Members ...	4,091	10	10	136	6	0
Subscribers ...	24	4	0	...	...	...
Employés ...	330	0	0	100	0	0
Oriental Publication Fund No. 1 ...	432	0	0	...	...	...
Sanskrit MSS. Fund	300	0	0	...	...	...
Miscellaneous ...	696	15	9	424	14	0
	5,874	14	7	661	4	0

	...	5,213	10 7
TOTAL Rs.	...	25,146	14 0

D. HOOPER,
Honorary Treasurer,
Asiatic Society of Bengal.

No. 9.

ment. *1912.*

Cr.

			Value.			Cost.		
			Rs.	As.	P.	Rs.	As.	P.
By Balance	...	...	... 2,38,700	0	0	2,35,951	0	10
		TOTAL Rs.	... 2,38,700	0	0	2,35,951	0	10

D. HOOPER,
Honorary Treasurer,
Asiatic Society of Bengal.

STATEMENT

1912. *Trust*

Dr.

		Rs.	As.	P.
To Pension		48	0	0
Balance		1,467	11	10
TOTAL Rs. ...		1,515	11	10

STATEMENT

1912. *Cash*

Dr.

	Rs.	As.	P.
To Balance from last Report	5,688	7	11

RECEIPTS.

	Rs.	As.	P.
To Asiatic Society	18,764	4	6
,, Oriental Publication Fund, No. 1 ...	10,520	12	1
,, Do. do. No. 2 ...	1,000	0	0
,, Sanskrit Manuscripts Fund	3,216	15	0
,, Arabic and Persian MSS. Fund ...	4,333	5	4
,, Personal Account	19,421	12	5
Trust Fund	49	0	0
	57,306	1	4
TOTAL Rs. ...	62,994	9	3

No. 10.

Fund. *1912.*

Cr.

			Rs.	As.	P.
By Balance from last Report	...	... ...	1,466	11	10
,, Interest on Investments	...	... ...	49	0	0
	TOTAL Rs.	...	1,515	11	10

D. HOOPER,

Honorary Treasurer,
Asiatic Society of Bengal.

No. 11.

Account. *1912.*

Cr.

EXPENDITURE.

			Rs.	As.	P.	Rs.	As.	P.
By Asiatic Society ...	...	...	34,125	8	4			
,, Oriental Publication Fund,		No. 1 ...	12,466	12	3			
,, Do.	do.	No. 2 ...	7,074	3	0			
,, Sanskrit Manuscripts Fund		...	2,055	15	6			
,, Arabic and Persian Manuscripts Fund		...	3,738	1	0			
,, Bardic Chronicles MSS. Fund		...	867	5	0			
,, Personal Account ...	...	...	1,053	0	4			
,, Trust Fund ...	...	...	48	0	0			
						61,428	13	5
	Balance	...	...			1,565	11	10
	TOTAL Rs.	...				62,994	9	3

D. HOOPER,

Honorary Treasurer,
Asiatic Society of Bengal.

STATEMENT

1912. *Balance*

LIABILITIES.

	Rs.	As.	P.	Rs.	As.	P.
Asiatic Society	2,32,334	7	8			
Oriental Publication Fund, No. 1... ...	3,193	5	5			
Do. do. No. 2... ...	625	3	0			
Do. do No. 3... ...	1,198	9	6			
Sanskrit Manuscripts Fund	2,394	4	8			
Arabic and Persian Manuscripts Fund ...	1,230	2	8			
Bardic Chronicles MSS. Fund	286	10	6			
Trust Fund	1,467	11	10			
				2,42,730	7	3
TOTAL Rs. ...				2,42,730	7	3

We have examined the above Balance Sheet, and the appended detailed Accounts with the books and vouchers presented to us, and certify that it is in accordance therewith, correctly setting forth the position of the Society as at the 31st December, 1912.

CALCUTTA,
26th February, 1913.

MEUGENS, KING & CO.,
Chartered Accountants,
Auditors.

No. 12.

Sheet. *1912.*

ASSETS.

	Rs.	As.	P.	Rs.	As. P.
Personal Account	5,213	10	7		
Investments ($3\frac{1}{2}$% Government Pro. Notes, Cost)	2,35,951	0	10		
Cash Account	1,565	11	10		
				2,42,730	7 3
3% Government Pro. Note at the Bank of Bengal's Safe Custody Account, Cashier's Security Deposit, Rs. 500				...	
TOTAL Rs. ...				2,42,730	7 3

D. HOOPER,

Honorary Treasurer,
Asiatic Society of Bengal.

MARCH, 1913.

The Monthly General Meeting of the Society was held on Wednesday, the 5th March, 1913, at 9-15 P.M.

MAHAMAHOPADHYAYA HARAPRASAD SHASTRI, C.I.E., Vice-President, in the chair.

Maulavi Abdul Wali, Dr. N. Annandale, Mr. J. Coggin Brown, Babu Nilmani Chakravarti, Mr. F. Doxey, Mr. Ekendra Nath Ghosh, Mr. T. P. Ghosh, Mr. F. H. Gravely, Mr. H. G Graves, Mr. A. H. Harley, Mr. D. Hooper, Rev. H. Hosten, S.J , Mr. J. Insch, Mr. K. P. Jayaswal, Babu Brojagopal Mukherji, Dr. Satis Chandra Vidyabhusana, Rev. J. Watt.

Visitor :—Mrs. Insch.

The minutes of the last meeting were read and confirmed.

Twenty-five presentations were announced.

The General Secretary reported that Rai Rajendra Chandra Sastri Bahadur and Major H. J. Williams, King's Dragoon Guards, have expressed a wish to withdraw from the Society.

The General Secretary read the names of the following gentlemen who were appointed to serve on the various Committees during 1913.

Finance Committee.

Dr. N. Annandale, Dr. W. A. K. Christie, Mahamahopadhyaya Haraprasad Shastri, C.I.E., Mr. W. K. Dods, Mr. R. D. Mehta, C.I.E., Mr. H. G. Tomkins, C.I.E.

Library Committee.

Dr. N. Annandale, Dr. W. A. K. Christie, Mahamahopadhyaya Haraprasad Shastri, C.I.E., Mr. J. A. Chapman, Dr. E. P. Harrison, Mr. H. H. Hayden, C.I.E., Lieut.-Col. F. P. Maynard, I.M.S., Capt. J. D. Sandes, I.M.S., Dr. E. D. Ross, C.I.E., Capt. C. L. Peart, I.A., Dr. G. Thibaut, C.I.E., Dr. D. B. Spooner, Mr. J. Coggin Brown.

Philological Committee.

Mr. Abdulla al-Mamun Suhrawardy, Hon. Mr. E. A. Gait, C.I.E., Dr. Girindra Nath Mukhopadhaya, Mahamahopadhyaya Haraprasad Shastri, C.I.E., Babu Monmohan Chakravarti,

Babu Muralidhar Banerji, Babu Nogendra Nath Vasu, Babu Rakhal Das Banerji, Dr. E. D. Ross, C.I.E., Capt. C. L. Peart, I.A., Dr. Satis Chandra Vidyabhusana, Dr. G. Thibaut, C.I.E., Maulavi Abdul Wali, Mr. A. Venis, Babu Nilmani Chakravarti.

The following gentlemen were balloted for as Ordinary Members :—

Prof. P. S. Macmahon, Canning College, Lucknow, proposed by Mr. S. W. Kemp, seconded by Dr. W A. K. Christie ; *Prof. T. L. Simonsen*, Presidency College, Madras, proposed by Mr. S. W. Kemp, seconded by Dr. W. A. K. Christie ; *Capt. David Munro*, M.B., I.M.S., proposed by Lieut.-Col. L. Rogers, C.I.E., seconded by Capt. J. D. Sandes, I.M.S.

Mr. K. P. Jayaswal exhibited an elephant-headed drain-pipe found in 1900 in the ruins of the old Rajagriha of the Brihadrathas and the Sisunagar.

The following papers were read :—

1. *Tipulidae and Culicidae from the Lake of Tiberias and Damascus. By* F. W. Edwards, B.A., F.G.S. *Communicated by* Dr. N. Annandale.

This paper has been published in the *Journal* for January 1913.

2. *A Preliminary Account of a revised Classification of Indo-Australian Passalidae. By* F. H. Gravely.

This paper has been published in the *Journal* for November 1912.

3. *Materials for a Flora of the Malayan Peninsula, No* 24. *By* J. Sykes Gamble, C.I.E., M.A., F.R.S., *late of the Indian Forest Department. Communicated by the Natural History Secretary.*

4. *Notes on the Biological work of the R.I.M.S.* "Investigator" *during the Survey Seasons* 1910–11 *and* 1911–12. *By* Capt. R. B. Seymour Sewell, I.M.S.

5. *The Internal Anatomy of the Blind Prawn of Galilee* (*Typhlocaris galilea Calm*). *By* Ekendranath Ghose, L.M.S., B.Sc.

6. *A Note on Rotifers from Galilee. By* C. F. Rousselet, F.Z.S. *Communicated by* Dr N. Annandale.

These four papers will be published in a subsequent number of the *Journal.*

7. *On the identification of the Soma Plant. By* Braja Lal Mukheri, M.A.

This paper has been returned to author for condensation.

8. *The Ancient Civilization of Bengal.* *By* MAHAMAHOPADHYAYA HARAPRASAD SHASTRI, C.I.E.

This paper has not yet been submitted to the Publication Committee.

The Adjourned Meeting of the Medical Section of the Society was held at the Society's Rooms on Wednesday, the 12th March, 1913, at 9-30 P.M.

COL. G. F. A. HARRIS, C.S.I., in the chair.

The following members were present :—

Dr. A. S. Allan, Capt. J. H. Burgess, I.M.S., Major E. D. W. Greig, I.M.S., Dr. W. C. Hossack, Surgeon-Captain F. F. MacCabe, Major D. McCay, I.M.S., Lt.-Col. E. A. R. Newman, I M.S., Dr. Indumadhab Mallick, Lt.-Col. A. H. Nott, I.M.S., Lt.-Col. F. O'Kinealy, I.M.S., Capt. J. D. Sandes, I.M.S., Honorary Secretary.

Visitors :—Capt. Green Armytage, I.M.S., Dr. G. N. Chatterjee, Major Dickinson, I.M.S., Dr. E. H. Hankin, Capt. R. B. Lloyd, I.M.S., Capt. E C. Phelan, I.M.S., Dr. D. Quinlan, Lt.-Col. A. Smith, I.M.S., Col. Sutherland, I.M.S., Major Winter, I.M.S., and two others.

The minutes of the last meeting were read and confirmed.

I. Clinical cases were shown :—

1. Lt.-Col. Nott showed a case of nerve thickening.

2. Lt.-Col. Newman showed a new form of towel clip and some new dressing materials.

II. The following paper was read :—

Sero diagnosis of Syphilis—By Lt.-Col. Sutherland, I.M.S.

Major Greig, Lt.-Col. O'Kinealy, Lt.-Col. Nott, Capt. Green Armytage, Dr. Mallick, Col. Harris spoke, and Col. Sutherland replied.

APRIL, 1913.

The Monthly General Meeting of the Society was held on Wednesday, the 2nd April, 1913, at 9-15 P.M.

His Excellency the Right Hon'ble THOMAS DAVID BARON CARMICHAEL OF SKIRLING, G.C.I.E., K.C.M.G., President, in the chair.

The following members were present:—

Maulavi Abdul Wali, Mr. J. C. Brown, Prof. P. J. Brühl, Mr. G. R. Clarke, Rev. W. K. Firminger, Mr. T. P. Ghose, Mr. F. H. Gravely, Mr. H. H. Hayden, C.I.E., Mr. D. Hooper, Rev. H. Hosten, S.J., Mr. W. Jessop, Mr. K. P. Jayaswal, Mr. S. W. Kemp, Mr. R. D. Mehta, C.I.E., Babu Brajolal Mukerjee, Capt. C. L. Peart, Mahamahopadhyaya Haraprasad Shastri, C.I.E., Rai Bahadur Lolitmohan Singha Ray, Mr. G. Stadler, Mahamahopadhyaya Dr. Satis Chandra Vidyabhusana, Rev. J. Watt.

Visitor:—Mr. G. M. Philips.

The minutes of the last meeting were read and confirmed.

Sixteen presentations were announced.

The General Secretary reported that Major G. P. Lenox-Conyngham, R.E., and Mr. H. Wright have expressed a wish to withdraw from the Society.

The following gentlemen were balloted for as Ordinary Members:—

Mr. R. S. Bhatnagar, Civil Judge, Shahpura, Rajputana, proposed by Rai Bahadur Ram Saran Das, seconded by Rai Bahadur Munna Lal; *Mr. Charles Cumming Calder*, Curator of Herbarium, Royal Botanic Garden, Sibpur, Howrah, proposed by Mr. D. Hooper, seconded by Mr. S. W. Kemp; *Mr. M. S. Rama Swami*, Officiating Curator of the Herbarium, Royal Botanic Garden, Sibpur, Howrah, proposed by Mr. D. Hopper, seconded by Mr S. W. Kemp; *Rai Saheb Bhagvati Sahay*, M.A., B.L., Officiating Inspector of Schools, Patna Division, Bankipur, proposed by Babu Panchanana Mukhopadhyaya, seconded by Mahamahopadhyaya Haraprasad Shastri, C.I.E.; *Mr. Bernard Alfred White*, Assistant, Messrs. Bird & Co., proposed by Mr. W. Kirkpatrick, seconded by Col. G. F. A. Harris, C.S.I.

Messrs. S. W. Kemp and J. Coggin-Brown exhibited a collection illustrative of Abor and Galong Ethnology.

The following papers were read :—

1. *Copies of two Recently Discovered Letters of Major James Rennell.—By* Rev. W. K. Firminger.

2. *Entomostraca from Lake Tiberias.—By* Robert Gurney. *Communicated by the Natural History Secretary.*

This paper will be published in a subsequent number of the *Journal.*

3. *On Srid-pa-ho: a Tibeto-Chinese tortoise chart of divination.—By* Dr. Satis Chandra Vidyabhusana.

This paper will be published in the *Memoirs.*

4. *Ancient History of Bengal: the portion of Banga Bagadha race.—By* Mahamahopadhyaya Haraprasad Shastri, C.I E.

This paper has not yet been submitted to the Publication Committee.

5. *Sarcocolla.—By* David Hooper.

The Adjourned Meeting of the Medical Section of the Society was held at the Society's Rooms on Wednesday, the 9th April, 1913, at 9-30 P.M.

Major D. McCay, I.M.S., in the chair.

The following members were present:—

Dr. Adrian Caddy, Dr. K. K. Chatterjee, Col. B. H. Deare, I.M.S., Major H. B. Foster, I.M.S., Dr. Harinath Ghosh, Dr. Indumadhav Mullick, Major J. W. F. Rait, I.M.S., Lt.-Col. L. Rogers, C.I.E., I.M.S.

Visitors:—Dr. Nanilal Pan and Dr. D. D. Wilson.

The minutes of the last meeting were read and confirmed.

I. Clinical cases were shown.

II. Lieut-Colonel L. Rogers showed a diagram and coloured drawings illustrating the distribution of the lesions of the bowels in dysentery.

III. A paper was read by Dr. Hari Nath Ghosh, Rai Bahadur, on the results of trial of four indigenous drugs at the Campbell Hospital.

(1) Ixora Coccinea (Rangon Phull) for dysentery.
(2) Holarrhena Antidysenterica (Kurchi) for dysentery.
(3) Meia Azadirachta (Nim) for fevers.
(4) Berberis Lyceum (Sarîo Haridra) for fevers.

Major Rait showed a patient from whom he had removed the spleen for rupture of the organ.

Dr. Caddy showed two X-ray photos illustrating a case of Antrum disease.

MAY, 1913.

The Monthly General Meeting of the Society was held on Wednesday, the 7th May, 1913, at 9-15 P.M.

D. HOOPER, Esq., F.C.S., F.L.S., F.A.S.B., in the chair.

The following members were present :—

Maulavi Abdul Wali, Mr. J. Coggin Brown, Dr. P. J. Brühl, Dr. L. L. Fermor, Rev. H. Hosten, S.J., Mr. J. Insch, Mr. H. C. Jones, Mr. W. A. Lee, Mr. G. Stadler.

The Minutes of the last Meeting were read and confirmed.

Twenty-three presentations were announced.

The General Secretary reported that the Hon. Sir Arthur Henry MacMahon, K.C.I.E.; Major William Frederick Travers O'Connor, C.I.E., R.A ; Mr. H. T. Cullis, I.C.S.; Nawab Ali Hossain Khan Sahib, Mr. C. Bergtheil, and Mr. D. Petrie have expressed a wish to withdraw from the Society.

The Chairman announced that Mr. G. H. Tipper had taken charge of the office of General Secretary from Mr. S. W. Kemp.

The following gentlemen were balloted for as Ordinary Members :—

Dr. E. H. Hankin, M.A., D.Sc., Grand Hotel, Calcutta, proposed by Lieut.-Col. L. Rogers, C.I.E., seconded by Capt. J. D. Sandes, I.M.S.; and *Pandit Manoharlal Zutshi*, M.A., Head Master, Government High School, Shahjahanpur, proposed by Ram Saran Das, Rai Bahadur, seconded by Dr. Munna Lal, Rai Bahadur.

The following papers were read :—

1. *A Synopsis of the Dioscoreas of the Old World, Africa excluded, with descriptions of new species and of varieties.—By* D. PRAIN *and* I. H. BURKILL.

This paper will be published in a subsequent number of the *Journal*.

2. *On Variations in the Flowers of Limnanthemum indicum, Thwaites.—By* H. M. CHIBBER. *Communicated by the Natural History Secretary.*

3. *Notes on Pollination of Colocasia Antiquorum.—By* MAUDE L. CLEGHORN. *Communicated by the Natural History Secretary.*

This paper will be published in a subsequent number of the *Journal.*

4. A *Double compound of mercuric oxide with Acetone.*—*By* JITENDRA NATH RAKSHIT. *Communicated by* DR. P. C. RAY.

Gunning (Zeit. anal. Chem., *24*, 147) observed that acetone has the property of dissolving precipitated mercuric oxide and devised the well-known method for the detection of acetone. Emerson Reynolds (Proc. Royal Soc., *17*, 431) and Kutscheroff (Ber. *17*, 20) have prepared the compound $3HgO, 2C_3H_6O$ from the solution of mercuric oxide in acetone. By the following process another condensation product is obtained. To a saturated solution of mercuric chloride excess of caustic soda is added. The mercuric oxide thus precipitated is washed twice with its equal bulk of water, so that the alkali is not completely removed. Then acetone is added drop by drop with constant agitation, till about two-thirds of mercuric oxide is dissolved. Finally it is shaken vigorously and allowed to settle for a few minutes, then filtered. The filtrate is evaporated on a water-bath and pale yellow, flaky crystals are obtained. They are washed and dried in a dessicator over sulphuric acid. 0·5940g gave 0·585g. HgS. Percentage of Hg = 84·89; C_3H_6O 3HgO requires Hg = 84·96 per cent. It has been observed that the presence of alkali is necessary for the condensation. Similar products are also obtained from a solution of mercuric chloride and acetone by alkali carbonates, ammonia and substituted ammonium bases.

The products formed, however, are not of the same appearance. I am engaged in preparing compounds of mercury and similar metals with other compounds containing ketonic radicals.

5. *Firoz Shah's Tunnels at Delhi: a note by* REV. H. HOSTEN, S.J.

I have twice already dealt with this subject (cf. *J.A.S.B.*, 1911, pp. 99–108; 1912, pp. 279–281). Sir Edward Maclagan, who is not less interested in it than myself, kindly sends me a further allusion to the Delhi tunnels, an extract from a letter dated Hodal, June 3, 1857, and addressed by P. H. (probably Mr. Harvey) to Colonel Becher, Camp, Delhi.

"The Raja of Bullubghur, a scoundrel, sent me the enclosed last night: 'There are unknown covered ways running all through the north part of Delhi'; but Metcalfe should know about these, one being supposed to run from Hindoo Rao's house to the Palace."[1]

[1] Cf. COL. KEITH YOUNG, *Delhi*,—1857, London, 1902, p. 77. This reference, being more than a month earlier than the incident related in *J.A.S.B.*, 1912. pp. 280–281, may explain how the soldiers, having got hold of the tradition, "would not be convinced but that the rebels were working a mine under their feet."

I am also informed that Mr. Gordon of the P.W.D. found lately in a cemetery lying between the Ludlow Castle Road and Underhill Road two shafts of an underground passage. They are about 30 ft. deep. Mr. Gordon thought they were almost certainly used for bringing water from the canal to feed some wells under the ridge. The connecting tunnel was about 4 ft. high out and filled with canal silt. The Executive Engineer at Delhi suggested the same explanation. If so, it is argued that the tunnel would not be earlier than the canal, viz., 'Alī Mardān Khān's time.

Since 'Alī Mardān Khān was at Delhi between 1637 and 1657. I answer that, if the shafts now discovered prove to be connected with his canal, they do not disprove the existence of Fīroz Shāh's tunnels, these being mentioned much earlier by Monserrate (1581), by Abū-l Faẓl (*ante* 1596) and Finch (1611). If Fīroz Shāh's tunnels had been aqueducts too, how is it possible that, two centuries at most after their construction, and at a time when they were in a much better state of preservation than they may be now, tradition stated they had been used by Fīroz Shāh to go from one place to another ?

Fīroz Shāh was himself a great builder of canals (cf. Elliot, *Hist. of India*, III. 300, 433; IV. 8, 11; VI. 225; VII. 86); but I fancy that these canals must have been open, above ground. Even, if in parts they should not have been so, it would be hard to understand how Abū-l Faẓl should have represented them as intended for quite a different purpose. Not only so, but in the very passage where he mentions the tunnels, he distinguishes them from a canal made by Fīroz Shāh near Fīrozābād. Cf. *Āīn*, Col. Jarrett's transl., II. 279.

Besides, the building of tunnels was not limited by Fīroz Shāh to Delhi. Within the fort of Hisār Fīrozah "a palace was built, which had no equal in the world, and the various apartments of which were contrived with infinite pains. One of the arrangements of this palace was that any person, having a general acquaintance with the place, after passing through several apartments, would arrive at the centre. This central apartment under the palace was very dark, and the passages were narrow, so that if the attendants did not guide the visitor he would never be able to find his way out. Indeed, it is said that a servant once went into that place, and, after he had been missing for some days, the guards went there in search of him and rescued him from the darkness."

This extract is taken from the *Tārīkh-i Fīroz Shāhī* of Shams-i Sirāj 'Afīf, one of Fīroz Shāh's court-historians (Elliot, *Hist. of India*, III. 299, 269). It is quite likely that Shams-i Sirāj 'Afīf described Fīroz Shāh's Delhi tunnels ; unfortunately, not one of the four MS. copies of his work used by Elliott was complete (*ibid.*, p. 271).

The underground passages in the Palace of Hisār Fīrozah

remind us of similar ones found in the Agra and Delhi forts. Tradition says that during the Mutiny two or three soldiers ventured into the underground passages of the Agra Fort, and were never heard of after.

Equally curious is a passage in Ibn Batūta, who was appointed judge of Delhi in the time of Fīroz Shāh's immediate predecessor, Muḥammad II, ibn Tughlaq (reigned 1325–51), son of Ghiyāṣu-d-dīn Tughlaq Shāh I (reigned 1320–25).

Delhi, he says, was of great extent. It consisted then of four neighbouring cities: Delhi, properly so called, the old city built by the idolators, and conquered in 584 H. (A.D. 1188); Sīrī, given by the Sulṭān to Ghiyāṣu-d-dīn (reigned 1266–87), grandson of the Khalif 'Abbāside Al Mustansir, when he came to visit him; Tughlaqābād, so called from the father of the Sulṭān of India whose court Ibn Batūta had come to visit; Jahān-panāh, the town specially designed for the residence of the then reigning Sulṭān of India, Muḥammad Shāh.

"He built it, and it was his intention to connect all these four cities together by one and the same wall. He raised a portion of it, but abandoned its completion in consequence of the enormous expense its erection would have entailed.

"The wall which surrounds Dehli has no equal. It is eleven cubits thick. Chambers are constructed in it which are occupied by the night watch and the persons charged with the care of the gates. In these chambers also there are stores of provisions called *ambār*, magazines of the munitions of war, and others in which are kept mangonels and *ra'ādas* ('thunderer'—a machine employed in sieges). Grain keeps in these chambers without change or the least deterioration. I saw some rice taken out of one of these magazines; it was black in colour, but good to the taste I also saw some millet taken out. All these provisions had been stored by Sultān Balban [1266–1287] ninety years before. *Horse and foot can pass inside this wall from one end of the city to the other. Windows to give light have been opened in it on the inside towards the city.* The lower part of the wall is built of stone, the upper part of brick. The bastions are numerous and closely placed. The city of Dehli has twenty-eight gates. First, that of Badāūn, which is the principal * * *" (ELLIOT, *Hist. of India*, III. 589–590).

It is difficult to see where were those walls within which horsemen and foot-soldiers could pass along from one end of the town to the other: whether at old Dehli or Pithaura, at Sīrī, where Ghiyāṣu-d-dīn Balban had his court and would have stored his grain; or at Jahān-panāh, where Muḥammad Shāh must have been chiefly residing. However that may be, the passage we have italicised makes it easier for us to understand how Fīroz Shāh, one of the greatest builders, if not the greatest, of the Delhi kings, should have thought of, and succeeded in,

connecting Pithaura, Fīrozābād, the Kushk-i-Shīkār and the river by means of three tunnels broad enough to allow the ladies of his harem to pass along in mounted procession.

After my visit to Delhi in January 1913, I am by no means sure that the ridge (*saltus*), which Monserrate speaks of, does not indicate Fīroz Shāh's Koṭilā. The pillar he mentions had been erected on the terrace of Fīroz Shāh's palace.[1] This would tally with the Koṭilā, not with what we know of the pillar on the northern ridge, and the ground near the Koṭilā is high and broken enough to justify the term *saltus*. If Monserrate can be understood as referring to the Koṭilā, the underground passage alluded to as going to Old Delhi, must have started from there, and so the tradition voiced by Monserrate, Abū-l-Fazl and Finch would with perfect uniformity have fixed upon the Koṭilā as the point whence the tunnels started and radiated. This may be an important clue to the archæologist. One of the exits must have been near the river, another near the Kushk-i-Shikār, a third near Rai Pithaura. A small distance from the Koṭilā, there is a partly covered passage; but besides appearing too narrow to justify the traditional explanations of Monserrate and Abū-l Fazl, it leads to a well or *baoli*. Still, I think that the ground should first be explored thoroughly in that direction. In case of ill-success, some excavations might be tried in a southerly direction from the *baoli* near Hindū Rao's house. If this also fails, let Aḥmad Khān's lines not be forgotten: "It is evident that by Old Dehli we must understand the castle and town of Raja Pithaura, for the third passage *is* in that place, and very old people say that he [Fīroz Shāh] went as far as a marvellous place and a special basin [tank]." The special basin, according to Aḥmad Khān, is the *Hauz 'Alai* or *Hauz-i-Khās*.[2]

6. *The Life and Works of Muhibb Allah of Bihar.*—*By* Maulavi M. Hidayat Hussain.

This paper will be published in a subsequent number of the *Journal*.

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[1] *J.A.S.B.*, 1911, p. 100. [2] *J.A.S.B.*, 1911, p. 103, *n.* 7.

JUNE, 1913.

The Monthly General Meeting of the Society was held on Wednesday, the 4th June, 1913, at 9-15 P.M.

MAHAMAHOPADHYAYA HARAPRASAD SHASTRI, C.I.E., F.A.S.B., Vice-President, in the chair.

The following members were present :—

Dr. N. Annandale, Mr. J. Coggin Brown, Dr. P. J. Brühl, Mr. H. G. Graves, Dr E. H. Hankin, Mr. D. Hooper, Mr. K. P. Jayaswal, Mr. W. Jessop, Mr. S. W. Kemp, Lt.-Col. F. P. Maynard, I.M.S., Hon. Mr. Justice T. W. Richardson, Maulavi Muhamad Kazim Shirazi, Mr. G. H. Tipper.

The minutes of the last meeting were read and confirmed.

Fourteen presentations were announced.

The General Secretary reported that Mr. J. C. Jack, I.C.S., has expressed a wish to withdraw from the Society.

The General Secretary laid on the table the following appeal for contributions to the Lister Memorial Fund :—

THE ROYAL SOCIETY,
BURLINGTON HOUSE,
LONDON, W.
19*th March*, 1913.

SIR,

The remarkable advance of surgical science achieved by the late Lord Lister, and the priceless benefits conferred by him on humanity at large by the alleviation of suffering and the mitigation of disease, have aroused in the British Isles a widespread desire that his epoch-making and beneficent work should be commemorated by some fitting memorial. A large and influential Committee has accordingly been formed in London for the purpose of raising the funds required for such a tribute to his memory, and a considerable sum has now been subscribed. It is proposed that the Memorial should be of a threefold character, and consist of (1) a simple marble medallion bearing a sculptured portrait of Lord Lister to be placed in Westminster Abbey among the monuments of the nation's illustrious dead; (2) a larger and more conspicuous monument to be erected in some public place in London, the city wherein he lived and worked; (3) if funds sufficient shall be obtained, the founding of an International Memorial Fund from which

either grants in aid of researches bearing on Surgery or rewards in recognition of important contributions to Surgical Science shall be made, irrespective of nationality.

We are led to believe that many persons in the British Dominions beyond the seas who are acquainted with Lord Lister's services will be glad of an opportunity of recognizing the debt which the world owes to the great Surgeon, and will be willing to assist in this movement to perpetuate his memory.

The sum already subscribed or promised is, perhaps, sufficient for the completion of the first two parts of the Memorial, but the funds in our hands are as yet insufficient for the adequate establishment of the third object. On behalf, therefore, of the Lister Memorial Committee we make this wider appeal for assistance in order that the provision of a Lister Memorial may be accomplished on a scale worthy of the illustrious man and of the debt under which the civilised world owes to him. We shall welcome all contributions as evidence of the appreciation with which Lord Lister's services are regarded.

We trust that in the important institution over which you preside there may be some who will make this appeal publicly known and would be willing to collect subscriptions, to be forwarded in due course to the London Committee.

Lord Lister was a member of many learned Academies and Societies throughout the world, and held Honorary Degrees from many foreign Universities. To these various institutions an appeal is also being made for contributions to the Fund.

Signed, in the name of the Lister Memorial Committee,

JOHN ROSE BRADFORD,

Honorary Secretary.

The President, Asiatic Society of Bengal, Calcutta.

The following gentlemen were balloted for as Ordinary Members :—

Mr. P. Chaudhuri, Bar.-at-Law, 2, Bright Street, Ballygunge, Calcutta, proposed by Mr. K. P. Jayaswal, seconded by Hon. Justice Sir Asutosh Mukherji, Kt.; *Babu Romesh Chandra Mazumdar*, M.A., 16, Chandranath Chatterji's Street, Bhowanipur, proposed by Dr. Satis Chandra Vidyabhusana, seconded by the Hon. Justice Sir Asutosh Mukherji, Kt.

The following papers were read :—

1. *The Pitt Diamond and the Eyes of Jagannath, Puri.* *By* REV. H. HOSTEN, S.J.

This paper has been published in the *Journal* for May, 1913.

2. *The Date of Asoka's Coronation (a new calculation).*—*By* K. P. JAYASWAL.

3. *The Plays of Bhasa, and King Darsaka of Magadha.*—*By* K. P. JAYASWAL.

These two papers will be published in a subsequent number of the *Journal*.

4. *The Action of Nitrosyl Chloride on Secondary Amines; Methylbenzylnitrosamine and Ethylbenzylnitrosamine.*—*By* RASIK LAL DATTA. *Communicated by* DR. P. C. ROY.

5. *A New Compound of Ethylacetoacetate with Mercuric Oxide.*—*By* SARATCHANDRA JANA. *Communicated by* DR. P. C. ROY.

Ethylacetoacetate, when shaken up with yellow oxide of mercury, gradually combines with it forming a white amorphous powder. This is washed with ether to free it from the excess of ester and dried on the water bath. The substance on analysis gave C = 24·6, H = 3·4 and Hg = 51·5. The white powder is probably a double compound of the ester and the oxide having the formula

$$3HgO \,.\, 4CH_3CO.CH_2COOC_2H_5$$

Theory for the latter demands C = 24·68, H = 3·42, Hg = 51·4.

The white powder is insoluble in water. It regenerates the ester on shaking up with dilute hydrochloric acid and the oxide of mercury goes into solution.

On warming the white powder with strong caustic potash solution the compound breaks up into its components, namely HgO and ester, and the latter undergoes hydrolysis, alcohol and acetic acid being formed—

$$CH_3COCH_2COOC_2H_5 + 2KOH = 2CH_3COOK + C_2H_5OH.$$

The addition of mercuric oxide to the ester and the formation of the double compound suggests the possibility of the formation of similar double compounds with ketonic esters. I am at present engaged in the preparation of similar double compounds with other organic substances containing the CO group.

6. *The Double Mercuri-periodides of Substituted Ammonium Bases. Terrapropylammonium Mercuri-periodide.*—*By* RASIK LAL DATTA *and* HARIDAS MUKHERJI. *Communicated by* Dr. P. C. ROY.

7. *On Two-shouldered Stone Implements from Assam.*—*By* HEM CHANDRA DAS-GUPTA. *Communicated by the Anthropological Secretary.*

This paper will be published in a subsequent number of the *Journal*.

8. *A new Springtail from Galilee.*—*By* Professor George H. Carpenter. *Communicated by* Dr. N. Annandale.

9. *Polyzoa from the Lake of Tiberias.*—*By* Dr. N. Annandale.

10. *Note on a Sponge Larva from the Lake of Tiberias.*—*By* Dr. N. Annandale.

JULY, 1913.

The Monthly General Meeting of the Society was held on Wednesday, the 2nd July, 1913, at 9-15 P.M.

MAHAMAHOPADHYAYA HARAPRASAD SHASTRI, C.I.E., F.A S.B., Vice-President, in the chair.

The following members were present :—

Maulavi Abdul Wali, Dr. N. Annandale, Mr. A. C. Atkinson, Lieut. T. L. Bomford, I.M.S., Mr. B. L. Chaudhuri, Dr. E. H. Hankin, Rev. H. Hosten, S J., Mr. W. Jessop, Mr. H. C. Jones, Mr. W. A. Lee, Mr. R. D. Mehta, C.I.E., Capt. C. L. Peart, I.A., Mr. G. Stadler, Dr. Satis Chandra Vidyabhusana, Rev. A. W. Young.

Visitors :—Mr. K. S. Antia, Mrs. Atkinson, Mr. A. M. Jukes, Mr. N. D. Katrak, Mr. D. D. Mehta, Mr. M. D. Mehta, Mr. N. D. Mehta, Mr. P. M. Mehta, Mr. J. J. Mod, Mr. J. R. Saklat, Mrs. E. C. Spooner, Mr. J. D. Yuzdar, Mr. E. P. Yuzdar.

The minutes of the last meeting were read and confirmed.

Twenty-six presentations were announced.

The General Secretary reported that Mr. A. C. McWatters, I.C.S., Major C. C R. Murphy, 30th Punjabis, Mr. R. C. Bonnerjee, Major J. Mulvany, I.M.S., Rev. Neil Meldrum and Mr. A. Hale have expressed a wish to withdraw from the Society.

The General Secretary reported the death of Rai Ram Saran Das, Bahadur.

The Chairman announced that owing to pressure of other work, Mr. G. H. Tipper had resigned the office of General Secretary and Captain C. L. Peart had been appointed in his place.

The following gentlemen were balloted for as Ordinary Members :—

Mr. E. L. Norton, I.C.S., Offg. District Magistrate, Allahabad, proposed by Lala Sita Ram, seconded by Babu Monan Dube; *Pandit Damodar Das Misra*, Secretary, Hardwar Municipality, proposed by Babu Ramavatar Pande, seconded by Mr. G. H. Tipper; *Babu Rudradut Sing*, M.A., LL.B, Vakil, Judicial Commissioner's Court, Lucknow, proposed by Lala Sita

Ram, seconded by Mahamahopadhyaya Haraprasad Shastri, C.I.E.; *Babu Shiva Prasad*, B.A., Offg. Junior Secretary to the Board of Revenue, United Provinces, proposed by Lala Sita Ram, seconded by Mahamahopadhyaya Haraprasad Shastri, C.I.E.; *Mr. P. T. Srinivas Iyenger*, Principal M.A.V.N. College, Vizagapatam, proposed by Sir Raja A. V. Jugga Row, seconded by Mr. S. P. V. Ranganathasvami.

The following papers were read :—

1. *Note on the Dragonflies of Syria and the Jordan Valley.* —*By* F. F. Laidlaw. *Communicated by* Dr. N. Annandale.

2. *The Crustacea Decapoda of the Lake of Tiberias.*—*By* N. Annandale, D.Sc., F.A.S.B., *and* S. W. Kemp, B.A., F.A.S.B.

These two papers have been published in the *Journal* for June, 1913.

3. *Mīrzā Ẓū-l Qarnaīn, the founder of the Agra College* (1592? *d.c.* 1660).—*By* Rev. H. Hosten, S.J.

This paper may be published in a subsequent number of the *Journal.*

4. *India in the Avesta of the Parsees.*—*By* Shamsulolma Dr. Jivanji Jamshedji Modi, B.A., Ph.D. *Communicated by the General Secretary.*

This paper has not yet been submitted to the Publication Committee.

AUGUST, 1913.

The Monthly General Meeting of the Society was held on Wednesday, the 6th August, 1913, at 9-15 P.M.

MAHAMAHOPADHYAYA HARAPRASAD SHASTRI, C.I.E., M.A., F.A.S.B., Vice-President, in the chair.

The following members were present :—

Maulavi Abdul Wali, Dr. N. Annandale, Dr. P. J. Brühl, Mr. E. Digby, Rev. H. Hosten, S.J., Mr. W. Kirkpatrick, Mr. W. A. Lee, Mr. G. Stadler.

The minutes of the last meeting were read and confirmed.

Seventy-five presentations were announced.

The General Secretary reported that Mr. T. A. Gopinath Rao, M.A., Superintendent of Archæology, Trivandrum, and Capt. F. R. Teesdale, Staff College, Quetta, have expressed a wish to withdraw from the Society.

The General Secretary reported the death of Mr. James Luke.

The following gentleman was balloted for as an Ordinary Member :—

Professor C. J. Brown, Canning College, Lucknow, proposed by Prof. P. S. MacMahon and seconded by Mr. G. H. Tipper.

Dr. P. J. Brühl protested against the custom of taking papers as read, and suggested that authors might be asked to attend and read their own papers.

The matter was referred to the Council, and it was decided to comply with the request as far as possible.

Dr. N. Annandale remarked that the meeting should express its regret that office-bearers of the Society did not make it convenient to attend the Ordinary Meetings of the Society with greater regularity.

This was reported to the Council and they concurred.

Dr. Brühl proposed that an abstract of each paper might be issued in advance, and Father Hosten suggested that this abstract might be circulated with the Programme of the Meeting.

The Council agreed to the proposal.

The following paper was read:—

1. *Nor'westers and Monsoon Prediction.* *By* E. DIGBY.

The reading of the following papers were postponed:—

1. *Constitutents of Andrographis paniculata.* *By* KSHITIBHUSAN BHADURI. *Communicated by* DR. U. N. BRAHMACHARI.

2. *Sayings of Lalesvari.* *By* ANAND KOUL.

3. *Birat and its neighbourhood.* *By* ABANICHANDRA CHATTERJI. *Communicated by* MR. K. C. DE.

4. *The Belabo Grant of Bhojavarman.* *By* R. D. BANERJI.

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The Adjourned Meeting of the Medical Section of the Society was held at the Society's Rooms on Wednesday, the 13th August, 1913, at 9-30 P.M.

LIEUT.-COLONEL L. ROGERS, C.I.E., I.M.S., in the chair.

The following members were present:—

Dr. Upendra Nath Brahmachari, Dr. K. K. Chatterjee, Dr. Indumadhab Mallick, Dr. Girindra Nath Mukerjee.

Visitors:—Dr. S. N. Mitter, Dr. H. C. Ganguly.

The minutes of the April meeting were read and confirmed.

I. A Clinical Case of Parotial Tumour in which post-operative fever due to previous septre.

II. The following papers were read:—

(1) The Staining Reaction of Anthrax Bacilli.—By S. N. Mitter.

(2) An investigation into the physico-chemical mechanism of haemolysis by specific haemolysins. (*Preliminary Communication*).—By U. N. Brahmachari, M.A., M.D.

SEPTEMBER, 1913.

The Monthly General Meeting of the Society was held on Wednesday, the 3rd September, 1913, at 9-15 P.M.

MAHAMAHOPADHYAYA HARAPRASAD SHASTRI, M.A., C.I.E., F.A.S.B., Vice-President, in the chair.

The following members were present:—

Maulavi Abdul Wali, Mr. J. Coggin Brown, Dr. P. J. Brühl, Dr. Ekendranath Ghosh, Mr. T. P. Ghosh, Dr. E. H. Hankin, Mr. H. H. Hayden, C.I.E., Mr. D. Hooper, Rev. H. Hosten, S.J., Mr. J. Insch, Mr. W. Jessop, Mr. S. W. Kemp, Mr. W. Kirkpatrick, Capt. C. L. Peart, I.A., Lt.-Col. L. Rogers, C.I.E., Mr. G. Stadler, Dr. Satis Chandra Vidyabhusana, Rev. J. Watt.

Visitor :—Mr. A. H. Kingston.

The minutes of the last meeting were read and confirmed.

Forty-two presentations were announced.

The General Secretary reported that Capt. F. P. Mackie, I.M.S., Babu Satis Kumar Banerji and Shah Munir Alam have expressed a wish to withdraw from the Society.

The General Secretary laid on the table the following letter from Mr. H. G. Lyons asking for a contribution to Hooker Memorial:—

5, HEATHVIEW GARDENS,
ROEHAMPTON, S.W.
August 2nd, 1913.

DEAR SIR,

The Dean and Chapter of Westminster Abbey having assented to a Memorial to the late Sir Joseph Hooker being placed in the Abbey, a sub-committee has been appointed by the Royal Society to take the necessary steps. Your Society, with which I believe Sir Joseph Hooker was long connected, may desire to be associated with such a memorial; I am therefore directed to ask whether your Society wishes to subscribe to it. The Memorial, which is to consist of a medallion with a short inscription, will not cost a large amount, so that small contributions will suffice to provide the total sum required.

Yours faithfully,
H. G. LYONS,
Hon. Sec., Hooker Memorial.

The Secretary, Asiatic Society, Bengal.

The Chairman announced that the Elliott Prizes for Scientific Research for the year 1912 will not be awarded as the essays received in competition were not of sufficient merit to justify the award of the Prizes.

The following gentlemen were balloted for as Ordinary Members :—

Mr. P. A. Rogalsky, Attaché to the Imperial Russian Consulate-General, proposed by Dr. E. Denison Ross, seconded by Mr. G. H. Tipper; *Prof. Ambica Charan Raksit*, M.A., City College, Calcutta, proposed by Dr. Satis Chandra Vidyabhusana, seconded by Hon. Justice Sir Asutosh Mukhopadhyaya, Kt.

Mr. S. W. Kemp, on behalf of Mr. E. C. Stuart Baker, exhibited a small collection of birds recently made in the Mishmi Hills by Capt. R. S. Kennedy, I.M.S., and presented by him to the Indian Museum.

Mr. Hooper exhibited a specimen of the gum of *Livistona chinensis* from Singapore.

The following papers were read :—

1. *Constituents of Andrographis paniculata. By* Kshitibhusan Bhaduri. *Communicated by* Dr. U. N. Brahmachari. (*Postponed from last meeting*).

This paper will not be published in the *Journal*.

2. *Sayings of Lalesvari. By* Anand Koul. (*Postponed from last Meeting*).

3. *Birat and its neighbourhood. By* Abanichandra Chatterji. *Communicated by* Mr. K. C. De. (*Postponed from last Meeting*).

These two papers have been referred back to the authors.

4. *The Belabo Grant of Bhojavarman. By* R. D. Banerji. (*Postponed from last Meeting*).

This paper will be published in a subsequent number of the Journal.

NOVEMBER, 1913.

The Monthly General Meeting of the Society was held on Wednesday, the 5th November, 1913, at 9-15 P.M.,

D. HOOPER, Esq., F.C.S., F.L.S., F.A.S.B., Vice-President, in the chair.

The following members were present:—

Maulavi Abdul Wali, Dr. N. Annandale, Mr. J. Coggin Brown, Dr. E. H. Hankin, the Rev. H. Hosten, S.J., Mr. J. Insch, Mr. W. Kirkpatrick, Capt. C. L. Peart, I.A., Dr G. E. Pilgrim, Lt.-Col. L. Rogers, I.M.S., Mr. G. Stadler and the Rev. A. W. Young.

Visitor:—Mr. E. M. Hayward.

The minutes of the last meeting were read and confirmed.

Eighty-four presentations were announced.

The Chairman, in unveiling a brass memorial tablet in commemoration of the late David Waldie, made the following remarks:—

David Waldie was born at Linlithgow, Scotland, on February 27th, 1813. He studied medicine in Edinburgh and practised for some time as an apothecary in his native town. Subsequently he went to Liverpool as an assistant in the Liverpool Apothecaries Co., and ultimately succeeded Dr. Brett, the company's chemist. While in Liverpool he played an important part in the discovery of the anaesthetic property of chloroform. Chloroform was discovered by Soubeiran, a French chemist, in 1831, and by Liebig in 1832. It received its present name from Dumas in 1834. In 1837 or 1838 it was introduced into England as chloric ether and was used as a spirituous solution. Waldie altered the process and prepared a liquor of uniform strength without the disagreeable flavour. In 1847 Dr. (afterwards Sir J. Y.) Simpson made enquiries for a new anaesthetic in place of ether, and Waldie recommended chloroform. Experiments were made and the substance proved so satisfactory that the results were communicated by Dr. Simpson to the Medico-Chirurgical Society of Edinburgh on the 10th November of that year. Since then it has become one of the greatest boons to mankind in surgical operations. Waldie came out to India in 1853 and established chemical works, the first of their kind, at Cossipore, which were afterwards transferred to Konnagar. He also undertook several investigations of a chemical nature. Waldie joined the Asiatic Society of Bengal in 1865. He served

on the Council from 1879 to the time of his death, and was made Vice-President in 1884 and 1885. He was a most regular attendant at the monthly meetings, and was always ready to further the work of the Society in auditing accounts and giving his services on various committees. He published several papers in the Journal and Proceedings, most of which were connected with the important subject of the water-supply of Calcutta. Between 1866 and 1867 he made an extensive series of observations on the water of the Hooghly, the results of which went to show that the water of the river was the purest that could be obtained—a conclusion that was at first controverted, but the correctness of which has since been confirmed. In 1873 Waldie contributed a paper "On the muddy water of the Hooghly during the rainy season with reference to its purification and to the Calcutta water-supply," in which the causes of the difficulties attending filtration were examined and explained. Dr. Waldie throughout his long period of residence in Calcutta never went to Europe nor visited the hills, and his health never seemed to suffer. He died here on the 23rd June 1889, aged 76 years.

This being the 100th anniversary of the birth of David Waldie, a memorial tablet is being erected in Linlithgow the place of his birth. Since he was also a citizen of Calcutta and a prominent member of the Society, the Council have been pleased to arrange for the erection of a tablet to his memory in the Society's building.

The General Secretary reported that Capt. W. Macrae, R.E., Major J. W. F. Rait, I.M.S., and Sir Archdale Earle, K.C.I.E., had expressed a wish to withdraw from the Society.

The following gentlemen were balloted for as Ordinary Members:—

Mr. Cyril S. Fox, Geological Survey of India, proposed by Dr. W. A. K. Christie, seconded by Mr. G. H. Tipper; *Mr. R. C. Burton*, Geological Survey of India, proposed by Dr. W. A. K. Christie, seconded by Mr. G. H. Tipper; *Maulavi Amin-Ullah*, Pleader and Vice-Chairman, Ghazipore Municipal Board, proposed by Babu Amulya Charan Vidyabhusana, seconded by Dr. Satis Chandra Vidyabhusana.

The following papers were read:—

1. *A Molluscan Faunal List of the Lake of Tiberias with descriptions of new species.*—*By* H. B. PRESTON. *Communicated by* N. ANNANDALE.

2. *The Planarians of the Lake of Tiberias.*—*By* R. H. WHITEHOUSE. *Communicated by* N. ANNANDALE.

3. *Aquatic and Semi-aquatic Rhynchota from the Lake of Tiberias and its immediate vicinity.*—*By* G. HORVATH. *Communicated by* N. ANNANDALE.

These papers will be published in the Journal.

4. *The Limestone Caves of Burma and the Malay Peninsula.*—*By* N. ANNANDALE, J. COGGIN BROWN, and F. H. GRAVELY.

The Adjourned Meeting of the Medical Section of the Society was held at the Society's Rooms on Wednesday, the 12th November, 1913, at 9-30 P.M.

LIEUT.-COLONEL W. J. BUCHANAN, I.M.S., in the chair.

The following members were present:—

Dr. A. S. Allan, Dr. U. N. Brahmachari, Dr. Adrian Caddy, Dr. K. K. Chatterjee, Major E. D. W. Greig, I.M.S., Dr. E. H. Hankin, Dr. Indumadhab Mallick, Lieut.-Colonel E. A. R. Newman, I.M.S., Lieut.-Colonel A. H. Nott, I.M.S., Lieut.-Colonel L. Rogers, I.M.S., Capt. J. D. Sandes, I.M.S., Honorary Secretary.

Visitors:—Dr. C. Banks, Dr. W. S. Allan.

The minutes of the August meeting were read and confirmed.

The Emetine and other treatments of Amoebic Dysentery and Hepatitis (including Liver abscess) were discussed.

Col. Rogers opened the discussion.

Papers were read by Lieut.-Colonel Nott, Lieut.-Colonel Newman, Major Munro and Dr. Seal.

The other papers were postponed.

DECEMBER, 1913.

The Monthly General Meeting of the Society was held on Wednesday, the 3rd December, 1913, at 9-15 P.M.

MAHAMAHOPADHYAYA HARAPRASAD SHASTRI, C.I.E., M.A., F.A.S.B., Vice-President, in the chair.

The following members were present :—

Maulvi Abdul Wali, Dr. N. Annandale, Dr. P. J. Brühl, Mr. J. Coggin Brown, Dr. Gopal Chandra Chatterji, The Hon. Mr. J. G. Cumming, Mr. T. P. Ghosh, Mr. F. H. Gravely, Mr. H. G. Graves, The Rev. H. Hosten, S.J., Mr. W. Kirkpatrick, Capt. C. L. Peart, Mr. G. Stadler, Dr. Satis Chandra Vidyabhusana.

Visitors :—The Rev. A. Gille, S.J., The Rev. P. Molitor, S.J., Mr. D. N. Mukerji, Dr. Young.

The minutes of the last meeting were read and confirmed.

Forty-one presentations were announced.

The Secretary reported that Major Clayton Lane, I.M.S., Mr. W. Leather, Mr. F. B. Bradley-Birt, Mr. E. B. Howell, Capt. T. F. Owens, I.M.S., The Hon. Mr. Justice S. Sharfuddin, Mr. J. H. Towle, Mr. P. N. Mukerjie, Capt. G. King, I.M.S., have expressed a wish to withdraw from the Society.

The following gentlemen were balloted for as Ordinary Members :—

Babu Prayag Prasad Tripathi, Asst. Master, Govt. High School, Arrah, proposed by Dr. Satis Chandra Vidyabhusana, seconded by Mahamahopadhyaya Haraprasad Shastri, C.I.E.; *Major Roger Parker Wilson*, F.R.C.S., D.P.H., I.M.S., Supdt., Campbell Hospital, Sealdah House, Calcutta, proposed by Lieut.-Col. L. Rogers, C.I.E., I.M.S., seconded by Capt. J. D. Sandes, I.M.S.; *Capt. Charles Aubrey Godson*, I.M.S., Resident Medical Officer, Medical College, Calcutta, proposed by Lieut.-Col. L. Rogers, C.I.E , I.M.S., seconded by Major E. D. W. Greig, I.M.S.; *Capt. James Alfred Shorten*, B.A., M.B., B.Ch., I.M.S., Offg. Professor of Physiology, Medical College, Calcutta, proposed by Lieut.-Col. L. Rogers, C.I.E., I.M.S , seconded by Major E. D. W. Greig, I.M.S.

The following papers were read :—

1. *The twelve Bhuiyas or Landlords of Bengal.—By* the REV. H. HOSTEN, S.J.

This paper has been published in the *Journal* for November 1913.

2. *The Rev. L. Bernard among the Abors, and the cross as a tattoo-mark* (1855).-- *A note by the* Rev. H. Hosten, S.J.

This paper has been published in the *Journal* for August 1913.

3. *Jayamangali.—By* S. P. V. Ramanujaswami.

4. *Fr. Jerome Xavier's Persian Lives of the Apostles.—By* the Rev. H. Hosten, S.J., *with Appendices by H. Beveridge and Aga Muhammad Kazim Shirazi.*

These two papers will be published in a subsequent number of the *Journal.*

5. *The Pitt Dimond and the Eyes of Jagannath, Puri. A further note by the* Rev. H. Hosten, S.J.

6. *The Nature of* moksa *in the Nyaya and* vaisesika *systems.—By* Vanamali Chakravarti.

7. *The Localization of certain Hymns of the Rigveda.—By* Mahamahopadhyaya Satis Chandra Vidyabhusana, M.A., Ph.D.

These two papers will be published in a subsequent number of the *Journal.*

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The Adjourned Meeting of the Medical Section of the Society was held at the Society's Rooms on Wednesday, the 10th December, 1913, at 9-30 P.M.

Lieut.-Colonel A. H. Nott, I.M.S., in the chair.

The following members were present :—

Capt. J H. Burgess, I.M S., Dr. Adrian Caddy, Dr. Gopal Chandra Chatterjee, Dr. K. K. Chatterjee, Dr. C. H. Elmes, Major E. D. W. Greig, I.M.S., Lieut.-Colonel E. A. R. Newman, I.M.S., Lieut. Colonel L. Rogers, I.M.S., Capt. J. D. Sandes, I.M.S., Honorary Secretary.

Visitors :—Capt. Green Armytage, I.M.S., Dr. W. M. Haffkine, Dr. J. B. Molony.

Minutes of the last meeting were read and confirmed.

The Discussion on the Emetine and other treatments of Amoebic Dysentery and Hepatitis were continued and other papers on the subject were read.

Col. Newman showed a new steam steriliser.

Col. Newman read a paper on Liver abscess and advocated opening and drainage as the best treatment.

Dr. Chatterjee and Capt. Sandes read papers on the same subject.

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TO THE

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